PROSPECT NO. 3 HYDROELECTRIC PROJECT
FERC PROJECT NO. P-2337

Final License Application
for Major Project—Existing Dam

Volume II
Exhibit E—Environmental Exhibit

December 2016

PROSPECT NO. 3 HYDROELECTRIC PROJECT
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Volume I: Initial Statement and Exhibits A, B, C, D, F, G, and H*
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(*Provided under separate cover)

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ACRONYMS AND ABBREVIATIONS

7DMAX—7-day, rolling average of 24-hour, maximum water temperatures
ACOE—Army Corps of Engineers
APE—area of potential effect
BLM—Bureau of Land Management
BMP—best management practice
ca.—circa
CCS—cryptocrystalline silicate
CEII—critical energy infrastructure information
CFR—Code of Federal Regulations
cfs—cubic feet per second
CH—critical habitat
CLNP—Crater Lake National Park
cm.—centimeters
cmbs—centimeters below surface
Commission—Federal Energy Regulatory Commission
CWA—Clean Water Act
DO—dissolved oxygen
DLA—draft license application
DPS—distinct population segment
ESCP—Erosion and Sediment Control Plan
FERC—Federal Energy Regulatory Commission
FLA—final license application
Forest Service—U.S. Forest Service
fps—feet per second
ft.—feet
FWS—Fish and Wildlife Service
hp—horse-power
HCC—Hydro Control Center in Ariel, Washington
HDPE—high-density polyethylene
HPMP—Historic Properties Management Plan
HRA—Historical Research Associates, Inc.
HSC—habitat suitability curve
HUC—Hydrologic Unit Code
IFIM—instream flow incremental method
IMCI—Imnaha Creek Inflow (i.e., above diversion) water quality monitoring site
in.—inches
kVA—kilovolt amps
kW—kilowatts
kWh—kilowatt hours
LIHI—Low Impact Hydropower Institute
LSR—late successional reserve
m.—meters
m^3—cubic meters
mi.—miles
MW—megawatts
MWh—megawatt hours

NEPA—National Environmental Policy Act
NFP—Northwest Forest Plan
NHPA—National Historic Preservation Act
NOAA—National Oceanic and Atmospheric Administration
NPS—National Park Service
NRCS—Natural Resources Conservation Service
NRF—nesting, roosting, and foraging habitat for northern spotted owl
NRHP—National Register of Historic Places
NSO—northern spotted owl
OAR—Oregon Administrative Rules
ODEQ—Oregon Department of Environmental Quality
ODFW—Oregon Department of Fish and Wildlife
ODOT—Oregon Department of Transportation
OHSD—Oregon Historic Sites Database
OPRD—Oregon Parks and Recreation Department
OWRD—Oregon Water Resources Department
Park Service—National Park Service
PCE—primary constituent elements
pH—power of hydrogen ions
PM&E—protection, mitigation, and enhancement
PRV—pressure relief valve
QTU—quarter test unit (for archaeological survey)
R/D radius—ratio of bend radius to pipe diameter
RM—river mile
rpm—revolutions per minute
RR-SNF—Rogue River-Siskiyou National Forest
S/M—Survey and Manage
SCADA—Supervisory Control and Data Acquisition
SCORP—Statewide Comprehensive Outdoor Recreation Plan
SEFA—System for Environmental Analysis
SFBL—South Fork Bypass Lower water quality monitoring site
SFBM—South Fork Bypass Middle water quality monitoring site
SFBU—South Fork Bypass Upper water quality monitoring site
SFRI—South Fork Rogue Inflow (i.e., above diversion) water quality monitoring site
SHPO—State Historic Preservation Office
SRG—Siskiyou Research Group
TCP—Traditional Cultural Properties
TMDL—Total Maximum Daily Load
TU—test unit (for archaeological survey)
UGB—urban growth boundary
USDA—United States Department of Agriculture
USDI—United States Department of Interior
USDOD—United States Department of Defense
USGS—United States Geological Survey
VQO—visual quality objective
WSE—water surface elevation
WUA—weighted useable area

EXECUTIVE SUMMARY

PacifiCorp proposes to continue operating the existing 7.2-megawatt (MW) Prospect No. 3 Hydroelectric Project (Project; Federal Energy Regulatory Commission (FERC) Project No. P-2337) located on the South Fork Rogue River, near the community of Prospect in northeastern Jackson County, Oregon. The 376.2-acre proposed Project occupies approximately 52.5 acres of federal lands administered by the United States Department of Agriculture (USDA) Forest Service, High Cascades Ranger District of the Rogue River-Siskiyou National Forest.

The Project primarily consists of a 172-foot-long, 24-foot-high concrete diversion dam; upstream and downstream fish passage facilities; a 15,894-foot-long conduit system; a powerhouse containing one generating unit with a rated capacity of 7,200 kilowatts (kW) operating under 713 feet of static head; and a 6.97-mile-long, 69-kilovolt transmission line. The Project is operated in run-of-river mode with no appreciable water storage capacity.

Before filing this license application, PacifiCorp conducted pre-filing consultation pursuant to FERC's integrated licensing process. The intent of FERC's pre-filing process is to initiate public involvement early in the Project planning process and to encourage citizens, governmental agencies, tribes, and other interested parties to identify and resolve issues prior to formal filing of the application with FERC. PacifiCorp initiated the process with filing of the Notice of Intent to File Application for New License and the Pre-Application Document on July 1, 2013. Scoping meetings, site visits, and study plan meetings lead to the approval of natural resource study plans, which were implemented across two study seasons from May 2014 to May 2016. The content developed during the pre-filing process was used to describe the affected environment of the Project and analyze the environmental effects of the proposed Project.

PacifiCorp does not propose any changes to the capacity or general operations of the Project but does propose measures for the protection, mitigation, and/or enhancement of environmental resources. These environmental resource measures primarily include: replacement of the existing woodstave flowline and sag-pipe with new steel pipelines; rehabilitation of the temporary vehicle access bridge over the flowline with a permanent structure satisfying Forest Service engineering standards; construction of a spur road from the flowline vehicle-access bridge to the bypassed reach to facilitate pass-through of bedload materials dredged from the South Fork impoundment to the bypassed reach; implementation of increased minimum in-stream flows of 30 cfs from March 1 through July 31 and 20 cfs from August 1 through February 28 within the bypassed reach of the South Fork Rogue River below the South Fork Diversion Dam; construction of an auxiliary bypass flow system to reliably provide minimum flows to the bypassed reach; relocation of the fish bypass return pipe discharge from Pool 6 of the fish ladder to Pool 1 of the fish ladder; modification of fish ladder weirs to facilitate the auxiliary bypass flow system and fish bypass return pipe construction; implementation of seasonal, operational ramping rates; construction of twelve-foot-wide wildlife crossings of the flowline and canal; construction of two-foot-wide wildlife crossings over the open canal; implementation of a Vegetation Management Plan that would establish sensitive species buffer zones and require treatment of noxious weeds prior to ground-disturbing activities; and implementation of a Historic Properties Management Plan to manage potential impacts on archeological, historic, and traditional cultural properties.

The proposed Project would provide a dependable source of electrical power generated from a renewable resource that would offset the use of fossil-fueled generating plants. The proposed environmental measures would adequately protect, mitigate, and/or enhance environmental resources affected by the Project.

EXHIBIT E−ENVIRONMENTAL EXHIBIT

E.1 DESCRIPTION OF THE ROGUE RIVER BASIN

The Rogue River Basin of southwestern Oregon covers a drainage area of approximately 5,156 square miles from its headwaters on the west slope of the Cascade Mountains to its terminus at the Pacific Ocean in Gold Beach, Oregon (Figure 1). The approximately 215-mile Rogue River is delineated in three unique reaches or sub-basins (USGS, 2015):

- the Upper Rogue, from Boundary Springs, on the border of Klamath and Douglas Counties within the northern border of Crater Lake National Park (CLNP), downstream to the confluence with Little Butte Creek, three miles southwest of Eagle Point;
- the Middle Rogue, from Little Butte Creek downstream to the confluence with the Applegate River, six miles west of Grants Pass; and
- the Lower Rogue, from the Applegate River to the Pacific Ocean at Gold Beach.

The Prospect No. 3 Hydroelectric Project (Project; FERC Project No. P-2337) diversion dam is located on the South Fork Rogue River, which is one of three major forks of the Upper Rogue—North, Middle, and South—in the approximately 1,616-square-mile Upper Rogue River sub-basin (Figure 2). The South and Middle Forks of the Rogue originate from headwater springs, small lakes, and/or runoff in the Sky Lakes Wilderness Area of the Rogue River-Siskiyou National Forest (RR-SNF).

Scoping Document 2 identified the geographic scope for cumulatively affected resources as "the Upper Rogue River Basin upstream of the William L. Jess dam" (FERC, 2013). FERC determined that "the potential effects of operation and maintenance of the Prospect Project…become less discernible downstream of the William L. Jess dam" (FERC, 2013). William L. Jess dam (Jess Dam) is a 327'-high, 3,750'-long rockfill embankment with a gated spillway and is owned and operated by the United States Department of Defense (USDOD) Army Corps of Engineers (ACOE) (U.S. Army Corps of Engineers, 2015). Jess Dam, which impounds the 3,430-acre Lost Creek Reservoir and forms the upstream barrier to anadromous fish migration in the Rogue River, is approximately 23 river miles upstream of Little Butte Creek and approximately ten miles downstream of the confluence of the South and North Fork Rogue.

The Upper Rogue Sub-Basin upstream of Jess Dam includes three watersheds: Headwaters Rogue River (Hydrologic Unit Code (HUC) 1710030701), South Fork Rogue River (HUC 1710030702), and Lost Creek-Rogue River (HUC 1710030703) (USGS, 2015). These three watersheds are collectively referred to as the "analysis watersheds" in Exhibit E (Figure 2). Project facilities from the diversion dam to the powerhouse and initial segments of the transmission line are within the South Fork Rogue River Watershed. The final 3.82 miles of the 6.97-mile-long transmission line are located in the lower reaches of the Headwaters Rogue River Watershed.

Figure 1. Rogue River basin map

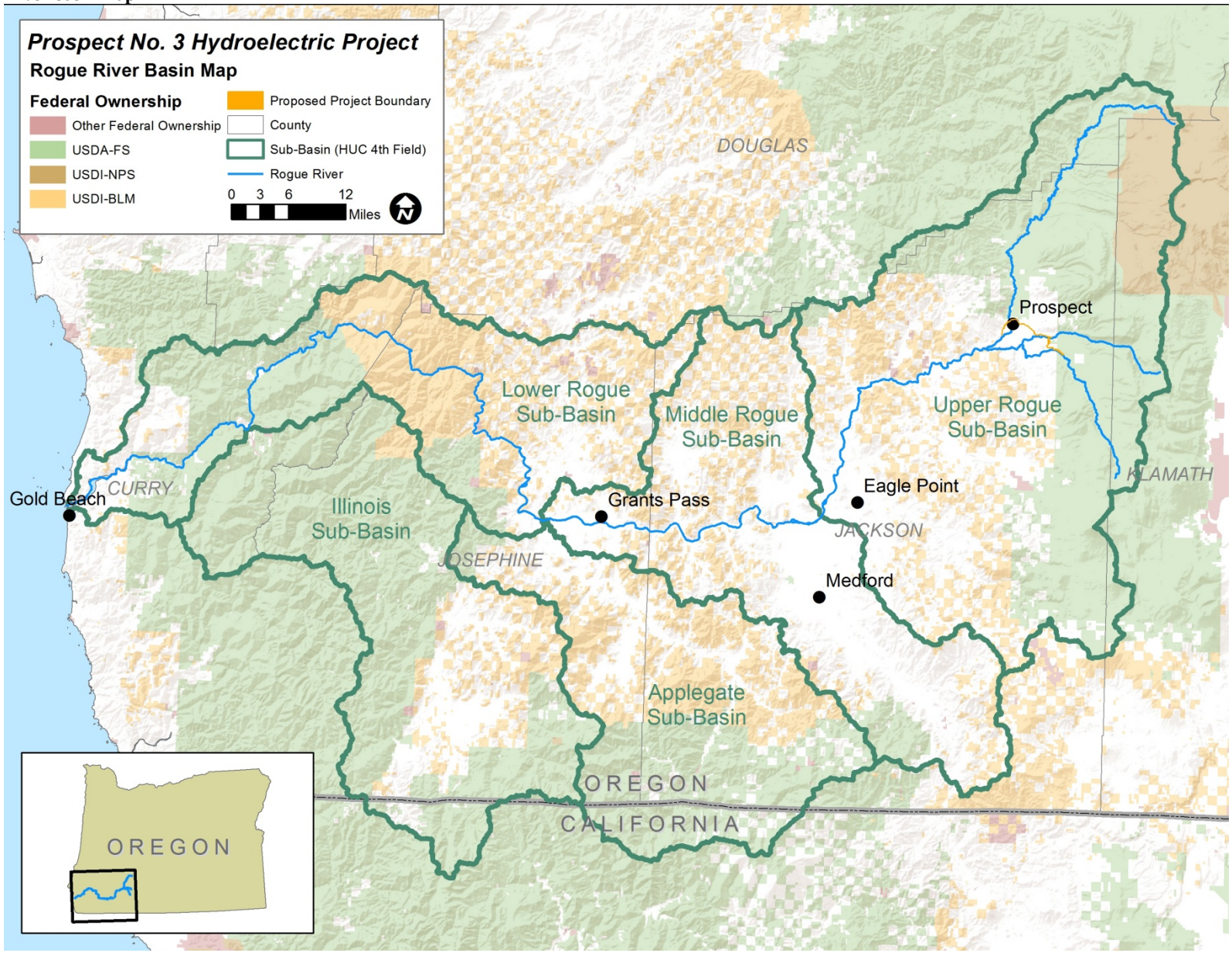
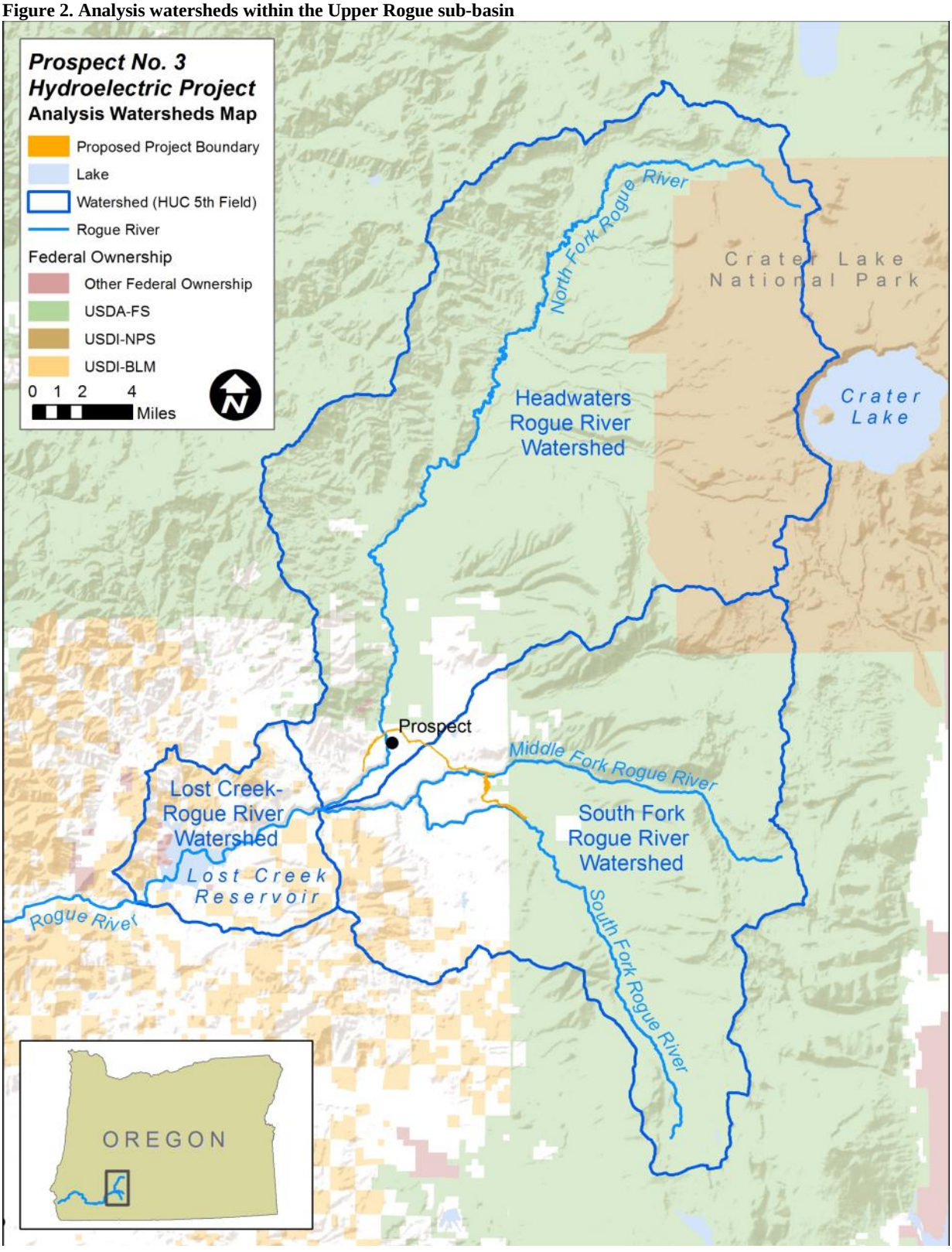


Figure 2. Analysis watersheds within the Upper Rogue sub-basin



The analysis watersheds sub-set of the Upper Rogue River Basin covers a drainage area of approximately 690 square miles upstream of Jess Dam. Approximately 85.6% of the drainage area is federally-owned and administered by, in order of magnitude, United States Department of Agriculture (USDA) Forest Service (Forest Service), United States Department of Interior (USDI) National Park Service (Park Service), USDI-Bureau of Land Management (BLM), and ACOE. The Forest Service administers approximately 448 square miles (65.0%) of the analysis watersheds. The remaining 14.4% of the analysis watersheds is privately owned, with the exception of 0.24 square miles of land owned by Oregon Parks and Recreation Department (OPRD) and operated as State Parks.

E.1.1 South Fork Rogue River

The South Fork Rogue River is approximately 26 miles in length and has a drainage area of approximately 251 squares miles, representing approximately five percent of the area in the Rogue River Basin. The stream originates at elevations between 5,600 feet and 5,700 feet in the South Blue Lake Group, a series of small lakes and springs in Sky Lakes Wilderness. For the first ten miles, the South Fork flows through a wide valley with a relatively low gradient. An elevation loss of approximately 1,000 feet occurs in this ten-mile headwater reach. At approximately ten miles below the source, the river flows into a canyon with a steep gradient. For the next five miles, the channel drops in elevation from approximately 4,600 feet to 3,400 feet as it flows through the canyon to the South Fork Diversion Dam at river mile (RM) 10.5[1]. Downstream of the diversion, the Project-bypassed reach of the South Fork Rogue River enters a narrow canyon. For the majority of its course from the diversion dam to Lost Creek Lake, the channel of the South Fork Rogue River is confined by the steep, sometimes sheer, walls of the canyon.

E.1.2 Climate

The analysis watersheds are approximately bounded by the high elevation weather station at CLNP ("CRATER LAKE NPS HQ, OR US"; elevation 6,475 ft.) and the low elevation weather station at Jess Dam ("LOST CREEK DAM, OR US"; elevation 1,580 ft.) (NOAA, 2011). The latest three-decade (1981-2010) averages of climatological variables are summarized in Table 1.

Table 1. Thirty-year average climate variables (1981-2010) (NOAA, 2011) (NRCS, 2015)

Climate Station	Precipitation (inches)	Snowfall (inches)	Winter Minimum Temperature (°F)	Annual Average Temperature (°F)	Summer Maximum Temperature (°F)
CRATER LAKE NPS HQ	66.21	495.2	18.1	37.9	65.5
LOST CREEK DAM	33.04	2.0	29.8	52.8	85.9

[1] The Project is approximately 182 river miles from the mouth of the Rogue River at Gold Beach, Oregon.

The western slope of the High Cascades Physiographic Province exhibits a defined, wet winter season and warm, dry summer season. More than half of the average annual precipitation falls from November through February (NOAA, 2011).

E.1.3 Major Land Uses and Economic Activities

The primary land use in the analysis watersheds is evergreen forest. Additional land uses include timber harvest, livestock pasture, cropland, and outdoor recreation (Crown, Meyers, Tugaw, & Turner, 2008). Over eighty percent of land in the analysis watersheds is federally owned within the RR-SNF and CLNP. There are limited (< 1.0 square mile) state holdings and no tribal holdings in the sub-basin (Upper Rogue Watershed Association, 2006). The remaining land is privately owned and primarily utilized for pasture, cropland, and/or rural development. There are no incorporated cities within the analysis watersheds. The unincorporated community of Prospect, which is adjacent to the western extent of the Project transmission line, supports an estimated population of 650 people (Shady Cove-Upper Rogue Chamber, 2013).

E.2 CUMULATIVE EFFECTS

E.2.1 Resources Potentially Subject to Cumulative Effects

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA), cumulative effects are impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

In Scoping Document 2, FERC indicated that the Project could have cumulative effects on water resources, fisheries resources, and terrestrial resources (FERC, 2013). Other activities that may cumulatively affect these resources in the analysis watersheds include road construction and maintenance, timber harvest, logging, animal grazing, agriculture, rural residences, irrigation, fish stocking, and gas pipeline construction[2]. Potential cumulative effects to the identified resources are analyzed in the respective sub-sections in Section E.6.

E.2.2 Geographic Scope of Analysis

The geographic scope of cumulative effects analysis defines the physical limits or boundaries of the proposed action's effects on resources. Because the proposed action would affect identified resources differently, the geographic scope for each resource may vary. Scoping Document 2 identified the geographic scope for cumulatively affected resources as "the Upper Rogue River

[2] "Gas pipeline construction" identified in Scoping Document 2 refers to the Pacific Connector Gas Pipeline, which is proposed for construction to the southwest and outside of the analysis watersheds (The Williams Companies, Inc., 2016) and therefore, excluded from the cumulative effects analysis.

Basin upstream of the William L. Jess dam" (FERC, 2013)(Figure 2). FERC determined that "the potential effects of operation and maintenance of the Prospect Project, in combination with the effects of other hydroelectric projects and land use practices more typical of the upper basin…become less discernible downstream of the William L. Jess dam" (FERC, 2013).

Jess Dam is the farthest upstream barrier to anadromous fish in the Rogue River Basin. With the exception of kokanee (*Oncorhynchus nerka*) and non-native, sport fish (e.g., smallmouth bass, et al.) in Lost Creek Reservoir (Oregon Department of Fish and Wildlife, 2016), fisheries resources above the dam are limited to resident trout species of rainbow trout (*Oncorhynchus mykiss*), cutthroat trout (*Oncorhynchus clarkii*), brook trout (*Salvelinus fontinalis*), and brown trout (*Salmo trutta*), as well as sculpin (*Cottus* sp.). Jess Dam also presents a barrier to the natural hydrodynamics of the river system by blocking unimpeded flow of sediments and debris. There are no other dams on the mainstem Rogue between Jess Dam and the Pacific Ocean. Downstream of Jess Dam the Upper Rogue is more consistent in character with the Middle Rogue sub-basin due to the low-gradient, broad valley terrain, and the increasing intensity of adjacent development and land use, which is inconsistent with that of the Upper Rogue sub-basin. The geology, botany, and wildlife resources downstream of the confluence of the North and South Fork Rogue are more indicative of the Western Cascade and Klamath Mountain eco-regions. Therefore there is a distinct anthropogenic and natural geographic boundary in the vicinity of Jess Dam.

The Prospect Nos. 1, 2, and 4 Hydroelectric Project (FERC Project No. P-2630) contributes to cumulative effects within the watersheds upstream of Jess Dam. PacifiCorp maintains a total cumulative water right of 1,050 cubic feet per second (cfs) from the South, Middle, and North Forks of the Rogue and Red Blanket Creek for power development at the Prospect Nos. 1, 2, and 4 and Prospect No. 3 projects. There are four other minor power development water rights totaling 5.64 cfs upstream of Jess Dam, including a private, cumulative water right of 3 cfs from Geppert Creek for the Mill-Mar Ranch in the South Fork Rogue Watershed and a private water right of 2.5 cfs from Skookum Creek in the Headwaters Rogue River Watershed (OWRD, 2012). There are fifteen water rights between 3.53 cfs and 1.04 cfs upstream of Jess Dam totaling 24.47 cfs for irrigation, domestic, and fish culture uses. All other water withdrawals upstream of Jess Dam are limited to minor water rights less than 1 cfs primarily for private irrigation, domestic, or livestock uses.

E.2.3 Temporal Scope of Analysis

The temporal scope of cumulative effects analysis includes a discussion of past, present and reasonably foreseeable future actions and their effects on water, fisheries, and terrestrial resources. Based on the term of the proposed license, the analysis will consider the next thirty to fifty years of reasonably foreseeable actions. The historical discussion is limited by available information and will focus on the time since construction of the Project in 1931.

E.3 APPLICABLE LAWS

E.3.1 Section 401 of the Clean Water Act

Pursuant to Section 401 of the Federal Water Pollution Control Act, commonly known as the Clean Water Act (CWA), a license applicant must obtain certification from the appropriate state pollution control agency that verifies compliance with the CWA. FERC regulations require that an applicant using the ILP file its request for water quality certification or waiver with the applicable agency within 60 days of the date FERC issues the notice of acceptance and ready for environmental analysis. Consistent with these requirements, PacifiCorp plans to file its application for water quality certification with the Oregon Department of Environmental Quality (ODEQ) on or before May 14, 2017 according to the process plan and schedule from the Pre-Application Document (PacifiCorp, 2013). PacifiCorp has consulted with ODEQ throughout the relicensing process regarding the design and implementation of water quality studies needed to support its application for water quality certification. Section E.6.2 summarizes the results of water quality studies, analyzes Project effects, and discusses proposed water quality PM&Es. Section E.9 provides a timeline of consultation with ODEQ and other stakeholders regarding water quality.

E.3.2 Endangered Species Act (ESA)

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of listed species or destroy or adversely modify critical habitat for such species. Two federally-listed terrestrial species are known to occur in the Project vicinity: northern spotted owl (NSO; *Strix occidentalis caurina*) and gray wolf (*Canis lupus*) (U.S. Fish & Wildlife Service, 2016). There is no critical habitat within the existing or proposed Project boundary, but NSO critical habitat occurs approximately 400 feet to the southeast of the southeast extent of the existing Project boundary. Jess Dam, approximately twenty miles downstream of the Project, is the upstream barrier to anadromous fish migration, and there are no listed fish species in the Project vicinity. FERC designated PacifiCorp as the non-federal representative for carrying out informal consultation with U.S. Fish and Wildlife Service (FWS) pursuant to Section 7 of the ESA (FERC, 2013). Section E.6.7 presents PacifiCorp's Biological Assessment of federally-listed species and forms the basis for any effect determinations in consultation with FWS.

E.3.3 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act as amended by the Sustainable Fisheries Act of 1996 requires federal agencies to consult with National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) on all actions that may adversely affect Essential Fish Habitat (EFH). EFH is defined as the waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. There is no designated EFH in the analysis watersheds upstream of Jess Dam (NOAA, 2015), and therefore, the Project would not adversely affect EFH.

E.3.4 Coastal Zone Management Act (CZMA)

Under Section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification. The Project is not located within Oregon's designated Coastal Management Zone, which extends inland to the community of Agness (RM 27) for the Rogue River Basin (Oregon Department of Land Conservation and Development, 2016), and the Project would not affect Oregon's coastal resources. By email dated January 11, 2016, the Oregon Department of Land Conservation and Development concurred that the Project is not subject to Oregon coastal zone program review and no consistency certification is required for Project relicensing (Wade, 2016).

E.3.5 National Historic Preservation Act (NHPA)

Section 106 of the National Historic Preservation Act of 1966 requires the Commission to take into account any effects to historic properties that may result from federal actions and to allow the Advisory Council on Historic Preservation a reasonable opportunity to comment on the proposed action. Historic properties include any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places. Section E.6.10 of this document presents analysis of Project effects on historic properties. As FERC's designated non-federal representative (FERC, 2013), PacifiCorp initiated informal consultation with various parties with interest in cultural resources, including the State Historic Preservation Office (SHPO), Forest Service, affected Indian tribes, and other stakeholders. Consultations regarding historic properties are summarized in Section E.9.

The Commission will review the cultural resource information provided in this license application and determine if it is necessary to execute a Programmatic Agreement (PA) to protect historic properties from potential effects of Project operation. The terms of the PA would ensure that the licensee address and properly treat all historic properties identified within the Project's area of potential effects (APE) through the implementation of a Historic Properties Management Plan (HPMP) or other protection measures. A draft HPMP is included in Appendix D of Volume III of this application.

E.3.6 Wild and Scenic Rivers and Wilderness Acts

Section 7(a) of the Wild and Scenic Rivers Act of 1968 prohibits the Commission from licensing any project located on or directly affecting any river that is designated as a component of the National Wild and Scenic Rivers System, or any river segment that Congress has designated for study. Designation under this act is intended to protect rivers with outstanding natural, cultural, and recreational values.

Upstream of the Project, 40.3 river miles of the North Fork Rogue River from the CLNP boundary downstream to the RR-SNF boundary at Prospect have been designated as wild or scenic (Interagency Wild & Scenic Rivers Coordinating Council, 2016). Downstream of the Project, 84.5 river miles of the mainstem Rogue River from the mouth of the Applegate River downstream to the Lobster Creek Bridge have been designated as wild, scenic, or recreational. The Project would not invade or unreasonably diminish the scenic, recreational, fish, or wildlife values of these designated river segments, which are not within the existing or proposed Project boundary. The Forest Service may make a final determination of Project effects under Section 7(a) coincident with submittal of the final Federal Power Act (FPA) Section 4(e) terms and conditions.

The Wilderness Act of 1964 protects areas that are "untrammeled by man". Under this act, the Commission may not license hydropower projects located within designated wilderness areas. The Project is not located within and would not impact a designated wilderness area.

E.4 PROJECT FACILITIES AND OPERATION

E.4.1 Facility Maps

Maps showing existing and proposed Project facilities, lands, and waters within the Project boundary are included under separate cover as Exhibit G of the license application.

E.4.2 Project Facility Configuration

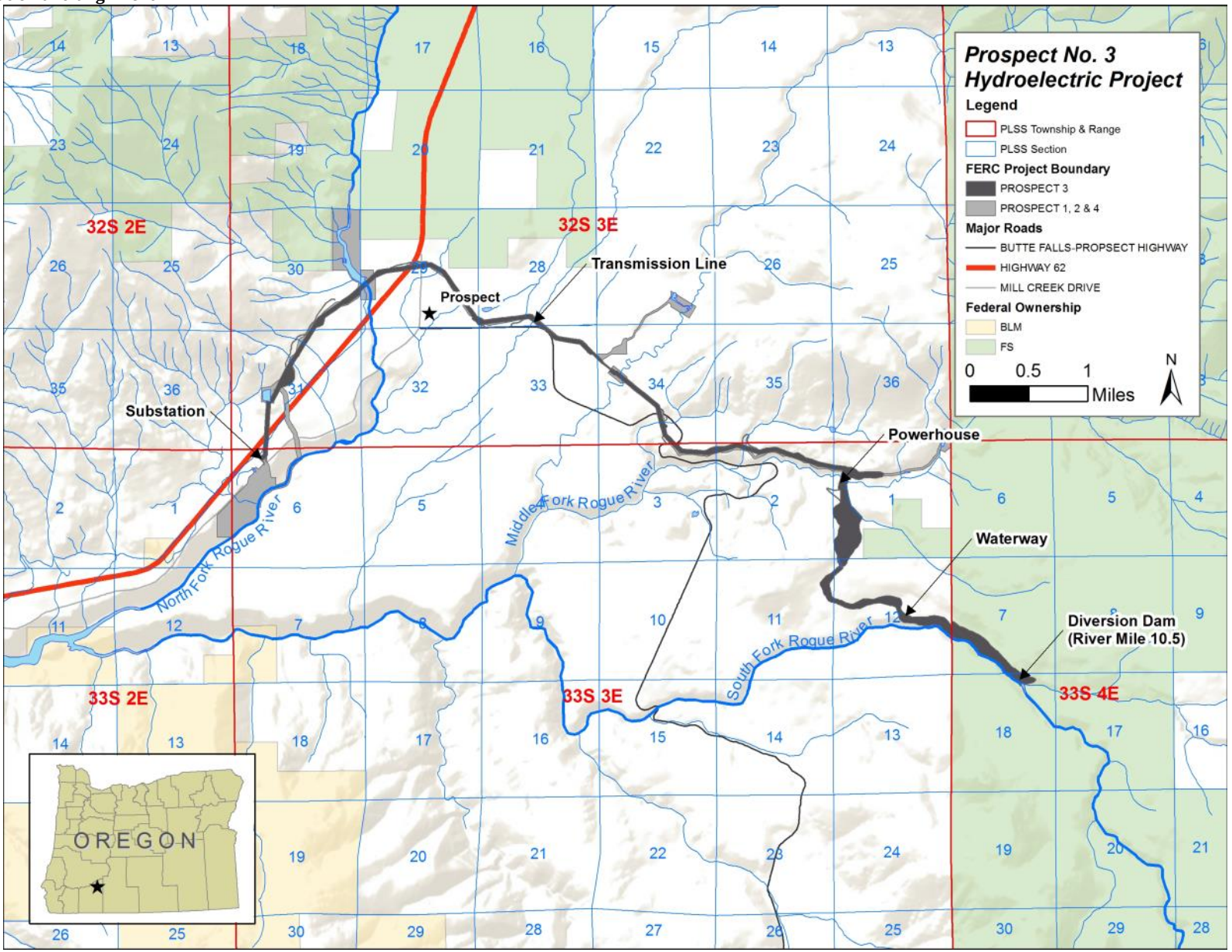
The Project is located east of the unincorporated community of Prospect in northeast Jackson County, Oregon (Figure 3). The approximately 336.7-acre existing Project occupies federal lands managed by the RR-SNF (approximately 38.1 acres) and private lands owned by PacifiCorp (approximately 298.6 acres). The Project is located primarily on the western slope of the High Cascade Mountains between the South Fork and Middle Fork Rogue River and descends 895 feet in elevation from the eastern extent at the diversion dam to the western extent at the Prospect Central Substation. The Project alignment transitions from federally owned lands of the RR-SNF to PacifiCorp-owned property, which bifurcates private timber company holdings and rural developments of the community of Prospect.

The existing Project consists of:

(1) a 172-foot-long, 24-foot-high, concrete diversion dam with a 98-foot-long, un-gated ogee spillway oriented to the northwest at RM 10.5 on the South Fork Rogue River;

(2) a 1-acre impoundment at elevation 3,375 feet with a gross capacity of 19-acre-feet;

Figure 3. Project location and alignment



(3) a fish passage facility on the northeast bank of the river, including (a) an 86-foot-long, 15-pool concrete ladder for upstream fish passage over the diversion dam, and (b) a 0.25-inch wedge-wire, inclined-plane fish screen with a surface area of 193 square feet, which transitions to a bypass pipe to return fish to Pool 6 of the ladder and facilitate downstream passage;

(4) a 15,894-foot-long conduit system with a primarily southeast-to-northwest alignment consisting of, in order, (a) a 273-foot-long concrete-lined canal section; (b) a 66-inch-diameter, 5,448-foot-long woodstave pipe; (c) a 5,805-foot-long concrete-lined canal section; (d) a 5-foot-wide by 6.5-foot-high, 698-foot-long, concrete-lined, horseshoe type tunnel; (e) a 416-foot-long canal to penstock transition (i.e. forebay) with a 2,486-foot-long side channel spillway that discharges to Daniel Creek; and (f) a 66-inch to 48-inch-diameter[3], 3,254-foot-long, riveted steel penstock with a south-to-north alignment;

(5) a powerhouse containing one generating unit with a rated capacity of 7,200 kW operating under a static head of 713.37 feet[4] and producing a 30-year (1986-2015) average annual energy output of 35,050 megawatt hours (MWh);

(6) a concrete tailrace structure approximately 20 feet by 20 feet by 5 feet with an automated backwater gate and 172-foot-long, concrete lined overflow spillway that discharges to Daniel Creek;

(7) a 66-inch, 887-foot-long woodstave sag-pipe that routes flows in a south-to-north alignment from the tailrace to the Middle Fork Canal of the Prospect Nos. 1, 2, and 4 Project (FERC No. P-2630); and

(8) a 6.97-mile-long, 69-kilovolt (kV) transmission line in a generally east-to-west alignment that connects the powerhouse to Prospect Central substation.

E.4.3 Project Impoundments

The South Fork Diversion Dam impounds the South Fork Rogue River at the elevation of the un-gated spillway crest at 3,375.7’ above sea level. At normal maximum pool, the impoundment has a surface area of approximately one acre. The retention time of impounded water is less than one hour. The impoundment has a gross storage capacity of approximately nineteen acre-feet and useable capacity of less than five acre-feet. Average and maximum depths are approximately five feet and eight feet, respectively, but subject to variation from sediment mobilization and retention.

[3] Previously reported incorrectly as “66-inch to 68-inch-diameter.” The penstock includes 66”, 60”, 54”, and 48” segments.
[4] Previously reported incorrectly as “static head of 740 feet.” The static head is measured from the hydraulic gradient (3,352.37’) to the centerline of the penstock where it enters the turbine (2,639.0’).

E.4.4 Project Turbines and Generators

The Project powerhouse components include:

(1) one 9,000 kVA Allis-Chalmers Company synchronous generator rated at 80% power factor, 720 revolutions per minute (rpm), three phases, 60 cycles, and 6,900 volts; and

(2) one 47-inch diameter, 10,700-horse-power (hp), vertical-shaft, Francis-type turbine with single runner reaction and spiral case manufactured by American Hydro Corporation and operating under 693 feet of net head.

The turbine can be manually operated to maximum hydraulic capacity of 7,200 kilowatts (kW)/150 cfs. During standard operation (automated mode), the minimum hydraulic capacity is approximately 200 kW/3 cfs.

E.4.5 Dependable Capacity and Average Annual Energy Production

The estimated dependable capacity of the Project is 7,200 kW at full load, down to approximately 1,000 kW at low flow periods. The 30-year (1986-2015) average annual generation is 35,050 megawatt hours (MWh), and the average monthly generation over the same period is 2,921 MWh.

E.4.6 Project Operation

E.4.6.1 Current Project Operation

The Project is operated as a run-of-the-river hydroelectric project. There is limited storage, and Project water diversions are dependent on inflow to the Project. PacifiCorp maintains a water right in perpetuity from the State of Oregon for 150 cfs from the South Fork Rogue River. Article 402 of the current license requires PacifiCorp to maintain a continuous minimum flow of 10 cfs, or the inflow to the Project, whichever is less, as measured at the South Fork Rogue River gaging station 0.25 mile downstream from the diversion. The current license does not specify any daily or seasonal ramping rates, flushing flows, reservoir operations, or flood control operations.

Water diverted from the South Fork Rogue to the Project powerhouse (Project Water) is conveyed directly from the Project tailrace to the Middle Fork Canal of the Prospect Nos. 1, 2, and 4 Hydroelectric Project located north of the Middle Fork Rogue on the slope opposite the powerhouse. This water is ultimately discharged into the North Fork Rogue at North Fork Reservoir. In general, Project Waters are not discharged to either the South Fork Rogue or Middle Fork Rogue. Therefore, the Project bypassed reach encompasses the South Fork Rogue River for 10.5 river miles to its confluence with the North Fork Rogue. Although Project operations result in flow reductions through the 10.5-mile length of the bypassed reach, potential Project effects on aquatic and fisheries resources are considerably less below RM 7.7 due to flow

augmentation from spring inflows, groundwater contributions, and major tributaries including the Middle Fork Rogue River at RM 4.5.

Unit trips occur when the Project generating unit unexpectedly goes offline, closing the wicket gates and stopping Project Water flow through the unit, in response to natural, mechanical, or electrical disturbances. These events are typically beyond PacifiCorp's control. Subsequent up-ramps in Daniel Creek and Middle Fork Rogue River via the overflow channels are generally not observed as a result of unit trips because of the pressure-relief valve (PRV) upstream of the generating unit. The PRV facilitates the flow of water through the conveyance system during a unit trip by bypassing the generating unit. In the past, the PRV was not incorporated into the Project's automatic control system, and the PRV stop nut position was manually set based on current flows. If diverted flows automatically increased in response to increased inflows to the Project, the previous manual setting of the PRV stop nut would have been insufficient to accept the full flow of the penstock during a unit trip, and Project Water would encounter a partial barrier to continuous flow, forcing Project Water in excess of the flow through the PRV to be spilled at the forebay and into Daniel Creek.

To minimize ramping events in Daniel Creek caused by unit trips, PacifiCorp automated the PRV. The necessary hardware and instrumentation were installed in August 2014, and software programming was completed in September 2014. Informal observations and fine-tuning of the system were conducted following commissioning of the system, and a formal test was successfully conducted during a planned outage in May 2015.

Unit trips alone do not result in an increase in spill in the South Fork bypassed reach below the diversion dam. The canal headgate is not automated to respond to the turbine wicket gates, and flows, if any, spilling over the dam and into South Fork at the time of a trip will remain consistent with the volume of inflows to the Project.

The normal mode of operation is for the plant to be unattended. Four Project operators are located in the community of Prospect and visit the Project on a daily basis and as directed by PacifiCorp's Hydro Control Center located in Ariel, Washington. The Hydro Control Center monitors Project operations remotely twenty-four hours per day, seven days per week and notifies local operators when issues arise. Automation upgrades completed in 2012 allow operators to monitor penstock pressure, generator load, forebay level, pressure relief valve aperture, generator stator temperature and front bearing temperature by the Supervisory Control and Data Acquisition (SCADA) system at the Project powerhouse, the Project office, North Fork Diversion Dam, Prospect No. 2 powerhouse, and Hydro Control Center. Systems can also be operated manually by on-site personnel.

There are automated trash rakes on the trash racks upstream of the intake structure at the diversion dam and upstream of the penstock intake at the forebay. There are also trash racks at the entrance to the woodstave flowline and tunnel segments of the waterway.

Annual Project maintenance is routinely conducted between June and September each year and consists of vegetation management; fence inspection and repair; woodstave flowline and sag-

pipe inspection and repair; fish passage facilities repair; erosion control; road maintenance; and as-needed maintenance on the water conveyance system and generating unit. The timing and scope of annual maintenance activities on federal lands are coordinated with the RR-SNF as provided in the Special-Use Permit issued for the Project by the Forest Service.

E.4.6.2 Project Safety

The Project has been operating for more than twenty-seven years under the existing license, and during this time, Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. PacifiCorp has not received any notices of violation from the Commission during the current license term.

E.4.6.3 Existing Environmental Measures and Compliance History

The Project was constructed in 1931 and 1932, and the original major license (No. P-2337) was issued to the California Oregon Power Company (COPCO) on July 30, 1931 for a period of thirty years. An additional minor-part license (Project No. 1163) was issued to COPCO on July 30, 1931 for the portion of the Project on the RR-SNF. This minor-part license included the diversion dam and approximately 4,000 feet of conduit that had not been completed at the time the license was issued. COPCO merged with Pacific Power and Light[5] on June 21, 1961, and the January 25, 1963 license application requested transfer of the license to Pacific Power and surrender of the minor-part license. By order dated July 8, 1964, the Commission issued a new license for the Project, including the facilities originally licensed in the separate minor-part license, for a period of twenty-five years. An application for new license was submitted on December 24, 1985, and the current license was issued on January 30, 1989 for a period of thirty years.

PacifiCorp has not been cited for a license violation during the current license term, and has never received a Notice of Violation from the Commission related to the Project. A brief history of compliance with current License articles and conditions is provided below.

License Article 101 requires, within six months following the date of license issuance, PacifiCorp to file with the Commission a special-use authorization approved and enforceable by the Forest Service. The RR-SNF issued a special-use permit to Pacific Power and Light Company on September 25, 1989 authorizing the Prospect No. 3 Hydroelectric Project to occupy RR-SNF lands. The special-use permit was filed with the Commission on September 26, 1989. The terms of the 1989 special-use permit are concurrent with the license and are void on December 31, 2018.

[5] Pacific Power and Light Company is a previous name of the business currently operating as Pacific Power under PacifiCorp.

License Article 102 requires PacifiCorp to consult annually with the Forest Service with regard to measures needed to ensure protection and development of natural resource values. Because of the limited maintenance required and the lack of new project facilities during the license term, annual coordination is generally limited to a brief phone call or electronic mail communication. PacifiCorp annually files a report with the Commission documenting the required consultation within two months of the meeting.

License Articles 103 through 106 and ***License Article 109*** required PacifiCorp to submit various mitigation and control plans. The required plans addressed fish and wildlife habitat mitigation (Article 103); erosion, stream sedimentation, dust and soil mass movement (Article 104); solid waste and wastewater (Article 105); oil and hazardous substances (Article 106); and pesticide and herbicide use (Article 109). ***License Article 401*** included similar requirements as Article 104, and the resulting erosion control plan satisfied both license articles. The plans were submitted to the Commission on January 30, 1990 and accepted by Commission order on February 23, 1990.

PacifiCorp has complied with ***License Article 107*** and no previously unrecorded archeological or historical sites were discovered during the course of construction or development of the Project during the current license period. Similarly, PacifiCorp has complied with ***License Article 108*** because there were not any changes in the location of any existing or proposed Project features or facilities or any changes in the uses of Project lands during the current license period.

License Article 402 requires that PacifiCorp maintain a continuous minimum flow of 10 cfs or the natural inflow to the impoundment, whichever is less, in the bypassed reach of the South Fork Rogue River, as measured at the U.S. Geological Survey gaging station 0.25 miles downstream from the dam (USGS Gage 14332000). Minimum flow is maintained by means of flow through the fish ladder and downstream fish return pipe, which discharges into Pool 6 of the fish ladder.

License Articles 403, 404, and 405 required PacifiCorp to submit a downstream fish passage plan, an upstream fish passage plan, and a fish passage monitoring plan, respectively, developed in consultation with ODFW and FWS. These three fish passage plans were initially required within six months of license issuance (i.e. July 30, 1989). However, prior to and following license issuance, ODFW was in the process of developing new, statewide fish protection facility criteria. PacifiCorp, ODFW, and FWS agreed that fisheries resources associated with the Project would be better served by waiting to design fish protection facilities until the new criteria were finalized. Therefore, with the support of the consulting agencies, PacifiCorp requested and was granted a series of extensions to the time required for compliance with these license articles. Commission orders on February 7, 1990, October 9, 1991, and January 25, 1993 progressively granted an extension to December 31, 1993. Although the statewide criteria were still in development, on December 9, 1993 ODFW requested that PacifiCorp proceed with design of the facility utilizing interim design criteria to be provided by ODFW at a future date. PacifiCorp requested an additional extension of time to December 31, 1994, which was granted by Commission order on February 1, 1994. ODFW provided a “Fish Screen Policy” with interim design standards to PacifiCorp on September 7, 1994, and PacifiCorp requested a final extension

of time with support of the consulting agencies on December 21, 1994. The February 14, 1995 Commission order and the subsequent July 3, 1995 order granting rehearing extended the date for submittal of the required plans to December 31, 1995. PacifiCorp filed the final upstream and downstream fish passage designs along with the monitoring plan on December 28, 1995. The plans and designs were accepted by Commission order on May 21, 1996.

Construction of the upstream and downstream fish passage facilities was completed in November 1996, and the final construction report was filed with the Commission on February 17, 1997. Testing of the downstream fish screen facilities in February 1997 revealed that approach velocities exceeded the criteria of 0.8 feet per second (fps) but could be ameliorated by modifying the baffles. Baffle testing was delayed by an extended Project outage for overhaul and controls upgrades from March 1997 through March 1998, during which time the system was dewatered. On March 20, 1998 with the support of the consulting agencies, PacifiCorp requested an extension of time to file the final monitoring report from April 1, 1998 to April 1, 2000. The Commission granted the requested extension in an order dated April 16, 1998. Initial evaluations in November 1999 revealed that fish were passing through the screen and into the waterway via seals in need of replacement, repair, and/or redesign. On March 16, 2000, PacifiCorp requested a final extension of time to remedy the faulty seals and obtain fish of adequate size for the monitoring studies. The date for submittal of the monitoring report was extended to September 2000 by order of the Commission on June 6, 2000. PacifiCorp submitted the final monitoring report to the Commission on August 31, 2000, and the report was accepted by the Commission on August 20, 2002.

Remote sensing instrumentation continuously monitors water levels upstream and downstream of the fish screen. The sensors detect water level fluctuations indicative of excessive debris loads on the screen face, prompting an automated backwash sequence, in which the screen is rotated along its horizontal axis so that canal flow will wash debris off of the screen face. Project operators perform a functional test of the backwash system monthly. Debris loads and/or residue may form on the screen face in a manner that regular automated backwashing will not remove. Operators monitor the screen face weekly and pressure-wash the screen when appropriate. Other fish passage facility operations and maintenance tasks are conducted pursuant to the schedule in Table 2 (PacifiCorp, 1995).

Table 2. Fish passage facilities operations and maintenance schedule for the existing license term

Downstream Passage Facilities	
Frequency	**Task**
Weekly	Inspect screen face for buildup not removed during backwash
Weekly	Inspect bypass conduits for debris
Monthly	Functional test of screen backwash system
Annually	Inspect screen integrity, seals, backwash drives, and other screen system equipment
As Required	Pressure wash screen

As Required	Remove screen assembly from canal, or rotate to neutral position, during potentially damaging seasonal conditions
As Required	Perform lubrication procedures in accordance with manufacturer's recommendations
Remote Sensing	
Frequency	**Task**
Daily	Monitor site remotely
Semi-annually	Calibrate remote sensing instrumentation and controls
Annually	Clean and inspect electrical auxiliary equipment
As Required	Inspect site if alarm conditions arise or data is questionable
Upstream Passage Facilities	
Frequency	**Task**
Weekly	Inspect ladder for debris blockage
Annually	Inspect ladder for excessive bed load and debris in pools
As Required	Remove debris jams or excessive bed load and debris in pools

License Article 406 required PacifiCorp to install wildlife crossings and fencing and file as-built drawings of these facilities within one year of license issuance. Additionally, PacifiCorp was required to submit an annual maintenance program for the wildlife crossings and canal fencing to the Commission within six months of license issuance. PacifiCorp filed the annual maintenance program with the Commission on July 6, 1989, and the program was approved by Commission order on September 7, 1989. The canal fencing and wildlife crossings, including six canal crossings and seven underpasses, were constructed in the fall of 1989. ODFW inspected the facilities on December 13, 1989 and provided written approval in a letter dated December 22, 1989. ODFW's approval letter and a figure detailing the as-built locations were included in Appendix C of the Fish and Wildlife Habitat Mitigation Plan filed with the Commission on January 30, 1990 pursuant to License Article 103. Annual monitoring and maintenance reports are filed with the Commission by January 30 of each year.

PacifiCorp has complied with ***License Article 407*** because there have not been any land-clearing or land-disturbing activities within the Project boundaries, other than those specifically authorized in the license, during the current license term.

License Article 408 required PacifiCorp to monitor recreation activity in the Project area for a period of five years and file a recreation report, prepared in consultation with the Oregon Parks and Recreation Division (OPRD) and Forest Service, with the Commission within six years of license issuance. The initial recreation monitoring report was filed with the Commission on January 23, 1995 and approved by Commission order on March 6, 1995. This order required PacifiCorp to continue recreation monitoring and to file a recreation monitoring report no later than January 31 of every sixth year. A second recreation monitoring report was filed with the

Commission on January 31, 2001. Both recreation monitoring reports identified less than 200 total visitors over each five-year period. With the support and concurrence of OPRD and Forest Service, PacifiCorp requested to be relieved from future monitoring given the limited recreational use and demand in the area. The Commission concurred with PacifiCorp's request, approved the 2001 report, and deleted Article 408 from the license by Commission order on April 3, 2001.

E.5 PROPOSED ACTION AND ALTERNATIVES

E.5.1 Proposed Action

PacifiCorp proposes to continue to operate and maintain the Project and implement environmental protection, mitigation, and enhancement (PM&E) measures consistent with the findings of the Initial Study Reports and Updated Study Reports filed with the Commission in May 2015 and May 2016, respectively. Proposed Project facilities, operations, and PM&E measures are detailed in the following sub-sections of Section E.5.1.

E.5.1.1 Proposed Project Facilities

PacifiCorp proposes to construct an auxiliary bypass flow system from one of the existing fish ladder exit orifices to a plunge pool at the base of the fish ladder to reliably provide increased minimum flows to the bypassed reach. PacifiCorp proposes to realign and extend the existing fish bypass return pipe discharge from Pool 6 to Pool 1 of the fish ladder. Changes to the fish bypass return pipe discharge location would result in reduced flow through Pools 6 through 2 of the fish ladder, and PacifiCorp proposes to modify the weir notches for Weirs 2 through 6 from 36"-wide to 18"-wide to provide consistent performance throughout the ladder. PacifiCorp proposes to replace the existing woodstave flowline and woodstave sag-pipe. The temporary vehicle-access bridge over the flowline would be rehabilitated to meet current Forest Service engineering standards following flowline replacement. PacifiCorp proposes to construct a road spur from the flowline vehicle-access bridge to the bank of the bypassed reach to facilitate pass-through of materials dredged from the impoundment upstream of the dam to the bypassed reach downstream of the dam. PacifiCorp proposes to upgrade the six existing four-foot-wide wildlife crossings of the canal to twelve feet in width. PacifiCorp also proposes to construct five twelve-foot-wide wildlife crossings of the new steel flowline and eight two-foot-wide wildlife crossings of the canal within the canal fencing. To facilitate compliance with proposed ramp rates, PacifiCorp proposes to install a communications link on the USGS' South Fork Rogue gage to deliver real-time flow readings to Project instrumentation and controls. The proposed facility construction schedule is identified below in Table 3.

Table 3. Proposed Project Facilities and Construction Schedule

Facility	Proposed Construction Completion
Auxiliary bypass flow system	2019
Fish bypass return pipe extension	2019
Fish ladder weir modifications	2019
Communications link and automation controls	2019
Steel flowline	2021
Steel sag-pipe	2021
Wildlife crossing upgrades	2021
Wildlife crossing construction	2021
Vehicle-access bridge over flowline intake	2022
Road spur from flowline bridge to bypassed reach	2022

PacifiCorp proposes to amend the Project boundary to remove lands outside of Project influence around the upper impoundment on RR-SNF property and surrounding the penstock and forebay overflow spillway on PacifiCorp property. In addition, PacifiCorp also proposes to add critical Project access roads to the boundary. These amendments, as depicted in Exhibit G, result in a net addition of 39.5 acres, including an addition of 20.1 acres of federal lands, an addition of 19.6 acres of PacifiCorp property, and a reduction of 0.2 acres of private land holdings.

E.5.1.2 Proposed Project Operation

The Project would continue to be operated in run-of-river mode with a maximum diversion of 150 cfs from the South Fork Rogue River. PacifiCorp proposes to increase the minimum in-stream flow in the South Fork Rogue River below the diversion dam to 30 cfs from March 1 through July 31 and 20 cfs from August 1 through February 28 to maximize incremental gains in fish habitat from proportionate increases in flow. PacifiCorp proposes an operational ramping schedule that is based on the ramp rates and periods established by the Prospect Nos. 1, 2, and 4 license for the bypassed reaches of Red Blanket Creek and Middle Fork Rogue River[6]. The ramp rates for these two streams were identified as protective of aquatic life, including sensitive life stages of native fish, based on a comprehensive ramping study (PacifiCorp, 2003). The proposed, seasonal operational ramp rates are identified in Table 4.

[6] May 1 through September 30, operational ramping should not exceed two inches per hour; October 1 through April 30, operational ramping should not exceed three inches per hour.

Table 4. Proposed operational ramp rates for South Fork Rogue River bypassed reach

Period	Target Ramp Rate (in/hr)
May 1 – September 30	Not to exceed 0.2 feet per hour
October 1 – April 30	Not to exceed 0.3 feet per hour

E.5.1.3 Proposed Environmental Measures

Geologic and Soils Resources

PacifiCorp proposes to:

- prepare and implement an Erosion and Sediment Control Plan to minimize the effects of ground-disturbing maintenance and construction projects;
- replace the existing woodstave flowline and sag-pipe with new steel pipelines of the same massing and alignment to reduce the potential for rupture and resultant erosion;
- stabilize loose rock, as identified in the flowline replacement preliminary geotechnical report (McMillen, LLC, 2014), through doweling, cabling, cable netting, or other acceptable methods coincident with woodstave flowline demolition and installation of the new steel flowline; and
- construct a spur road from the flowline vehicle-access bridge to the bypassed reach to facilitate pass-through of bedload materials dredged from the impoundment upstream of the dam to the bypassed reach downstream of the dam.

Fisheries Resources

PacifiCorp proposes to:

- implement minimum in-stream flows of 30 cfs from March 1 through July 31 and 20 cfs from August 1 through February 28 within the bypassed reach of the South Fork Rogue River below the South Fork Diversion Dam as measured at the USGS gage at RM 10.0;
- construct an auxiliary bypass flow system from one of the existing fish ladder exit orifices to a plunge pool at the base of the fish ladder (construction includes modifications and repairs to Weirs 14 and 15 of the fish ladder);
- implement seasonal, operational ramping rates not to exceed 0.2 feet per hour from May 1 through September 30 and 0.3 feet per hour from October 1 through April 30;
- report operations-induced variances (i.e., non-natural events) of the minimum in-stream flow and/or ramping rate within 24 hours of discovery and in a summary annual report for each water year;
- construct a road spur from the flowline vehicle-access bridge to the bank of the bypassed reach to facilitate pass-through of bedload materials dredged from the impoundment upstream of the dam to the bypassed reach downstream of the dam;

- prepare an updated Fish Passage Facilities Operations and Maintenance Plan, incorporating revised maintenance activities and schedules;
- realign and extend the existing fish bypass return pipe discharge from Pool 6 to Pool 1 of the fish ladder;
- modify the weir notches for fish ladder Weirs 2 through 6 from 36”-wide to 18”-wide
- prepare a second update of the Fish Passage Facilities Operations and Maintenance Plan following completion of upgrades and modifications to the fish passage facilities; and
- operate and maintain the fish passage facilities according to the revised Plan.

Terrestrial Resources

PacifiCorp proposes to:

- upgrade the existing four-foot-wide wildlife crossings to twelve feet in width[7];
- construct eight two-foot-wide wildlife crossings over the open canal and within the canal fencing;
- construct five twelve-foot-wide crossings of the flowline at potential locations identified in the flowline conceptual design report (McMillen, LLC, 2014); and
- prepare and implement a Vegetation Management Plan that would establish sensitive species buffer zones and require treatment of noxious weeds prior to ground-disturbing activities.

Cultural Resources

PacifiCorp proposes to:

- prepare and implement a Historic Properties Management Plan to manage potential impacts on archeological, historic, and traditional cultural properties within the Project’s Area of Potential Effect (APE).

E.5.2 No-Action Alternative

The no-action alternative is the baseline from which to compare the proposed action and all action alternatives that are assessed in the environmental document. Under the no-action alternative, the Project would continue to operate under the terms and conditions of the current license. The no-action alternative would include the existing facilities and current Project operation and maintenance as described in Section E.4.

[7] Crossing structures will utilize pre-cast concrete panels covered with a minimum of two inches of native soil cover. Twelve-foot-wide crossings will also have woody debris along one side for simulated ground cover and large boulders installed at four-foot intervals in a ten-foot radius from the crossing entrances to prevent vehicle access.

E.5.3 Federal Government Takeover

In accordance with § 16.14 of the Commission's regulations, a federal department or agency may file a recommendation that the United States exercise its right to take over a hydroelectric power project with a license that is subject to sections 14 and 15 of the FPA.[8] In Scoping Document 2 (FERC, 2013), the Commission determined that federal takeover was not a reasonable alternative. Federal takeover of the project would require congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence showing that federal takeover should be recommended to Congress. No party has suggested that federal takeover would be appropriate, and no federal agency has expressed interest in operating the project.

E.5.4 Non-power License

A non-power license is a temporary license the Commission would terminate whenever it determines that another governmental agency is authorized and willing to assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this time, no governmental agency has suggested a willingness or ability to take over the project. No party has sought a non-power license, and the Commission has no basis for concluding that the Project should no longer be used to produce power. The Commission concluded that a non-power license is not a reasonable alternative to relicensing the project (FERC, 2013).

E.5.5 Project Decommissioning

Decommissioning of the project could be accomplished with or without dam removal. Either alternative would require the Commission to deny the relicense application and surrender or termination of the existing license with appropriate conditions. There would be significant costs involved with decommissioning the project and/or removing any project facilities. Decommissioning efforts, including Project dam removal, are estimated at $5.9 million. The project provides a viable, safe, and renewable source of power to the region. With decommissioning, the project would no longer be authorized to generate power.

No party has suggested Project decommissioning would be appropriate in this case. The Commission does not consider Project decommissioning a reasonable alternative to relicensing the Project with appropriate environmental measures (FERC, 2013).

E.6 ENVIRONMENTAL ANALYSIS

The environmental analysis provided herein is based on information filed in the Pre-Application Document (PacifiCorp, 2013), developed under the approved study plans (FERC, 2014), and other appropriate information developed or obtained by PacifiCorp as cited. The affected

[8] 16 U.S.C. §§ 791(a)-825(r).

environment (FPA §5.18(b)(5)(ii)(A)), analysis (5.18(b)(5)(ii)(B)), proposed environmental measures (5.18(b)(5)(ii)(C)), unavoidable adverse impacts (5.18(b)(5)(ii)(D)), economic analysis ((5.18(b)(5)(ii)(E)), and cumulative impacts (FPA §5.18(b)(2)), where applicable, are presented by resource area.

E.6.1 Geology and Soils

E.6.1.1 Affected Environment

Project generation facilities are underlain by the geologically recent, volcanic formations of the High Cascades physiographic province. These formations vary in age from 6,800 to over 8 million years old (USDA Forest Service, 1998). As recently as 15,000 years ago, the High Cascades were covered in glacial ice, ultimately resulting in subsequent glacial outwash deposits at higher elevations (>5,000 feet). The topography of the High Cascades is characteristic of a broad upland plateau with scattered volcanic cones that are easily recognizable due to only slight modifications by erosion (Johnson, 1993). Steep relief in the High Cascades also occurs in glacially carved river canyons such as that of the Middle Fork Rogue.

The Project vicinity includes some exposed, older deposits of basalt, but these basaltic flows are generally overlain with younger lava flows of basaltic andesite (USDA Forest Service, 1998). The remaining geologic formations are deposits associated with the eruption of Mt. Mazama approximately 6,800 years ago. These deposits include pyroclastic rocks and volcanic sediments, including ashflow and airfall pumice. Relatively soft rock types (e.g. tuff, breccias, agglomerate) are overlain by more resistant material (e.g. andesite, basalt). The geology of the Project west of the North Fork Rogue exhibits older, Miocene-age (over 5.3 million years ago), pyroclastic rocks typical of the Western Cascade physiographic province (Badura & Jahn, 1977).

Regional volcanism and its resultant geology and topography are products of the subduction of the oceanic Juan de Fuca tectonic plate beneath the continental North American tectonic plate. A major fault begins at the headwaters of the Middle Fork and continues south beyond the crest of the South Fork Rogue watershed (USDA Forest Service, 1998).

The Project vicinity exhibits abundant reserves of sand and gravel resources, as well as lava flows suitable for crushed rock and large rock for road construction. There are no known metallic mineral or petroleum resources in the vicinity, and past studies indicated that there is little potential for discovery of such resources in the watershed (USDA Forest Service, 1998).

The United States Department of Agriculture and Natural Resources Conservation Service (NRCS), formerly Soil Conservation Service, conducted a soil survey of the Jackson County Area in 1993. The subsequent report is the primary source of information for this discussion (Johnson, 1993). Soils were categorized by general types, including complexes or associations of multiple types, and further refined into specific map units based on slope and aspect of the location. A Soil Resources Inventory (SRI) prepared by the Forest Service (Badura & Jahn, 1977) was utilized to synthesize information regarding soil resources on National Forest lands.

The spatial information contained in the SRI is of limited utility at the scale of the Project Vicinity and in the context of current geographic information systems (GIS) technology, but the soil descriptions provided in the SRI were used to fill in the gaps in information on federal lands, which are not mapped by the NRCS.

The diversity of soil types within the Project Area is primarily a function of the transmission line alignment, which traverses seven different soil types in eleven map units. The primary Project works within the NRCS' survey area, including the powerhouse and the majority of the waterway, are within four primary soil types: Coyata-rock outcrop complex, Crater Lake-Alcot association, Crater Lake-rock outcrop complex, and Dumont-Coyata association. These soil types account for four of the five types with the largest areal extent. The Freezener-Geppert complex is located below the portion of the transmission line running parallel to North Fork Canal in the western-most portion of the Project area. The four primary soil types are discussed in additional detail below.

While the eastern portion of the Project on the RR-SNF was not specifically covered in the NRCS survey, it is reasonable to assume that this upper portion is also composed of Coyata-rock outcrop complex and Dumont-Coyata association soils. The South Fork canyon is mapped as Coyata-rock outcrop complex for approximately 2.62 miles west of the Forest boundary; this segment of the river is consistent in character with the upper segment from east of the Forest boundary to the Project boundary east of the diversion dam. Additionally, the character and topography of the hill slopes on both sides of the river east of the Forest boundary are consistent with the areas mapped as Dumont-Coyata association soils immediately to the west of the Forest boundary. The SRI identifies these areas primarily as sandy loams on 0 to 15 percent slopes and clay loams on 35 to 65 percent slopes.

The ***Coyata-rock outcrop complex*** is found on 35 to 80 percent slopes of the South Fork Rogue River canyon and is likely associated with the diversion site and woodstave flowline alignment, as described in the preceding paragraph. This soil type is approximately 50 percent Coyata soil and 30 percent rock outcrop. The Coyata soil, which was formed in colluviums derived primarily from andesite, is moderately deep and well drained. Bedrock is at an average depth of 31 inches. Runoff from these soils is rapid, and the hazard of water erosion is high

The ***Crater Lake-Alcot association*** occurs below a small portion of the penstock and on large tracts of land between the north and middle forks of the Rogue beneath the transmission line alignment. Both soil types are deep, well- to somewhat-excessively-drained, and formed in volcanic ash and pumice. The depth to bedrock is 60 inches or more. Because these soils are moderately well drained, the speed of runoff and hazard of water erosion are primarily a function of slope and aspect. The unit under the penstock is on a 12 to 35 percent north slope, and as such, runoff is moderate, and the hazard of water erosion is moderate to high.

The ***Crater Lake-rock outcrop complex*** is found on both aspects of 35 to 70 percent hill slopes in the Middle Fork Rogue River canyon. The powerhouse and terminal 565 feet of penstock are located on this soil unit. The complex is approximately 55 percent Crater Lake soil and 20 percent rock outcrop. The Crater Lake soil, which was formed in volcanic ash and pumice, is

very deep and well drained. The depth to bedrock is 60 inches or more. This complex is subject to rapid runoff and high potential for water erosion.

The majority of Project features, including all of the canal, tunnel, and forebay, as well as segments of the flowline and penstock, occur on ***Dumont-Coyata association*** soils. These gravelly loams are located on plateaus of 1 to 12 percent slopes and hill slopes from 12 to 60 percent. The association is composed of approximately 50 percent Dumont soil and 30 to 35 percent Coyata soil. As the Coyata described above, Dumont soils are formed in colluviums derived predominantly from andesite. The soil is deep and well drained, but permeability is slow. The depth to bedrock is 60 inches or more. Runoff and erosive hazards are a function of the slope, but the majority of the Project waterway is located on a plateau, for which runoff is slow and the hazard of water erosion is slight.

Management considerations for these soil types that are applicable to the Project include the following:

- high erodability in areas of low plant cover;
- site disturbance including construction activities may result in slope instability problems such as soil erosion, sloughing, and raveling;
- soils are prone to compaction;
- excavation increases the risk of water erosion;
- erosion control measures may be needed to reduce soil loss from cut- and fill-slopes;
- soil is susceptible to being pushed from its natural position during equipment operations;
- un-surfaced roads on hillsides are sticky and soft when wet and dusty when dry; and
- special precautions may be needed to control soil loss following activities that expose the soil.

E.6.1.2 Project Effects

In March and April of 1989, significant horizontal movement of an existing landslide adjacent to the forebay required remediation and additional monitoring of the slide area. The landslide, which dates back to the late 1940s or early 1950s, is located on the downstream, northeast side of the forebay entrance to the penstock. In 1951, the forebay and adjoining canal segment were realigned to repair or prevent damage to the canal because of landslide action. Formal monitoring of the slide, consisting of manual measurements of displacement, began in 1982. The significant movement in early 1989 amounted to seven to eight inches of horizontal movement. At this time, it was determined that erosion within the forebay spillway was contributing to movement of the slide. Repair activities in 1990 consisted of filling the spillway ravine with 20,000 cubic yards of rock fill to a depth of approximately 25 feet and a distance of approximately 400 feet in an effort to control erosion in the spillway and buttress the slide area. Post-construction monitoring revealed that additional horizontal movement had been reduced, and a report of the incident, including remediation and monitoring, was provided to the Commission on July 30, 1990. Automation of the pressure-relief valve (PRV), completed in 2014, to respond to forebay water levels, would reduce the frequency, duration, and volume of

forebay spillway discharge (see Section E.4.6.1) and reduce the potential for erosion and/or additional landslide movement at the forebay and forebay spillway.

On the afternoon of March 15, 2006, a rockslide occurred uphill of the woodstave flowline. A large boulder fell and punched a hole in the flowline, which caused the unit to trip offline and the flowline to spill approximately 130 cfs of water into the bypass reach. Following consultation with the Commission, ODFW, and Forest Service, the Commission granted authorization to conduct emergency repairs on March 17, 2006. PacifiCorp submitted a construction plan to Forest Service for approval on March 21, 2006, and Forest Service approved the submitted construction plan on March 22, 2006. Repairs commenced on March 23, 2006 with slope stabilization and flowline footing replacement. Woodstave replacement work was completed on March 31, 2006, and the unit was returned to service on April 3, 2006. A report with photos of the incident was submitted to the Commission on May 5, 2006. Adan Archuleta provided Commission acknowledgement and approval of the report via e-mail on June 5, 2006.

The flowline incurred additional damage from a large boulder in late 2012. The boulder, which broke from an exposed scarp approximately 1,200 feet from the head works, was discovered during water-up inspections on November 28, 2012 following an annual maintenance outage. Due to the proximity of the damage to the intake and the timing of the water-up inspection, a minimal amount of water was released from the waterway to the river. A plan for flowline repair and rockfall remediation was submitted to Forest Service on December 3, 2012, and Forest Service approved the plan on December 6, 2012. Scaling removed loose rock and debris from the scarp, and cable lashings, nets, and rock dowels were installed to preserve the current position of the lower breccia rock and upper massive basalt block assemblages. Following stabilization of the scarp, damaged flowline sections were replaced. Repairs were completed on January 17, 2013.

The preliminary geotechnical report prepared by Cornforth Consultants, Inc. (Cornforth) for the flowline and sag-pipe replacement conceptual design report (McMillen, LLC, 2014) indicates that there are no signs of ancient landslides; global instability; historically-active, deep-seated slumps; or rotational slides associated with the existing and proposed alignments of the flowline and sag-pipe (see Volume IV, Appendix F-3). Rockfall from the slopes above the flowline is coincident to the Project and is generally not the result of Project construction, operations, or maintenance. However, the preliminary geotechnical report identifies nine locations with evidence of rock failures and/or high potential of falling rock along the flowline. These locations exhibit potential to damage the flowline and result in water erosion of sediments adjacent to and below the flowline. Cornforth's report indicates several small slope failures, which are the result of water leakage from the woodstave pipe, currently exist along the flowline. Leakage from the sag-pipe also results in water erosion and mobilization of sediments below the sag-pipe to the Middle Fork Rogue River.

Construction and maintenance of project access roads, waterways, and staging areas has resulted in the removal of vegetative cover and the exposure and compaction of soils. In particular, the dam access road and penstock slope were identified in Scoping Document 2 (FERC, 2013) for their potential impact to soil resources. With respect to the penstock slope, grasses, forbs, and

shrubs provide over eighty percent areal cover on average, and water bars are present where necessary to route leakage and/or precipitation-derived sheet flows to natural drainages primarily to the east of the penstock alignment, thereby reducing the potential for erosion along this slope during normal operating conditions. Water bars are also present on the dam access road to facilitate appropriate draining and prevent volumes of water that may otherwise mobilize sediments on an exposed native surface slope. However, potential for future erosion along the dam access road would increase if the water bars and ditch lines are not maintained properly. Scoping Document 2 also identified "project-related recreation" effects on sloughing and soil erosion (FERC, 2013), but PacifiCorp has not observed any such recreation during the current license term and does not expect any such recreation as a result of the proposed Project.

There are no known existing erosive conditions, mass soil movement, slumping or other unstable conditions associated with Project impoundment shorelines and stream banks.

Under the no action alternative the woodstave flowline and siphon would remain in place until catastrophic failures necessitate their replacement or decommissioning. The existing facilities would continue to leak through the wood staves, and in the case of the flowline, remain susceptible to significant leaks resulting from rockfall damage. Catastrophic rupture of either the flowline or siphon could result in significant erosive events that could mobilize channel-altering volumes of sediment to the South or Middle Fork Rogue Rivers, respectively.

E.6.1.3 Proposed Environmental Measures

PacifiCorp proposes to replace the existing 5,350-foot-long, 66-inch-diameter woodstave flowline and 734-foot-long, 66-inch-diameter woodstave sag-pipe facilities with new steel pipelines[9] with the same massing and alignment to reduce leakage, potential for rupture from rockfall, and resultant erosion from these processes. A conceptual design report was prepared to analyze construction alternatives and feasibility for these facility upgrades (McMillen, LLC, 2014)(Volume IV, Appendix F-3). PacifiCorp's estimated cost for replacement of the existing woodstave flowline and sag-pipe is $13.8 million.

The physical constraints of the narrow and rocky flowline alignment are the primary limiting factor in analysis of construction alternatives for the flowline. Three alternatives, including pipe material, joint type, and partially-buried versus elevated pipe construction variables, were analyzed. Several three- to ten-foot-high gabion basket walls along the upslope or downslope side of the bench would need to be constructed to provide permanent access. In addition, the conceptual design report calls for construction of several "wide turn-out" areas in geologically stable reaches of the alignment to assist with moving and staging equipment and materials. Construction access would have to be cleared as the existing woodstave flowline is demolished and removed. Nine existing and/or high-potential rockfall areas identified in the preliminary geotechnical report would be remediated prior to personnel working below these threats. Final

[9] Future commodity prices (e.g., steel, oil, etc.) and construction methods may dictate other construction alternatives at the time of flowline and sag-pipe replacement. Construction designs will be submitted to FERC for review and approval.

rockfall remediation methods would be determined in consultation with the construction contractor.

A temporary vehicle bridge was installed over the flowline to provide construction access to the Project head-works facilities at the time of fish passage facilities construction in 1996. Permanent vehicle access to the fish passage facilities and control building at the diversion dam is required for on-going Project operations and maintenance. The temporary bridge would be rehabilitated or replaced in the same vicinity of the existing bridge at the conclusion of the flowline replacement to meet Forest Service engineering specifications. PacifiCorp's estimated cost for rehabilitation of the vehicle bridge is $222,000.

PacifiCorp identified elevated, 5/16-inch-thick, steel pipeline as the preferred alternative for the flowline replacement[10]. The steel pipe invert would be two to three feet above the surface elevation with pre-cast concrete foundations and column supports at approximately forty-foot intervals. One advantage to the above ground installation is that it mitigates for unknown below-grade conditions, including large sections of hard rock that may be present along the alignment, and provides a cost estimate with a higher degree of certainty. In addition, leaks are easily detected during visual inspections of an elevated flowline. Construction of the flowline is estimated to take eight months.

The existing and potential access to the sag-pipe provides a clearer optimum alternative for replacement: elevated, 5/16-inch-thick, steel pipeline with concrete foundations and column supports at approximately forty-foot intervals. The existing steel pipe segment crossing the Middle Fork Rogue River would be reconditioned and remain in place. The 64-foot section of woodstave pipe supported by a steel trestle on the north bank of the Middle Fork would be replaced with 0.50-inch thick steel pipe. Steel cable anchors providing additional seismic support to the existing columns at the river crossing would be included in the final design. Construction of the sag-pipe replacement would occur concurrently within the more critical construction window for the flowline, thereby reducing the overall length of Project outages.

PacifiCorp proposes to prepare and implement an Erosion and Sediment Control Plan (ESCP; Volume III, Appendix A) to minimize the effects of ground-disturbing maintenance and construction projects, including the flowline and sag-pipe replacements. The ESCP would include inspection and maintenance schedules and specifications for ensuring the proper operation of erosion and sediment controls, including Project access road waterbars. The ESCP would identify erosion control best management practices (BMPs) to be implemented during any ground-disturbing activities. Erosion control BMPs would include the categories and activities identified in the following bulleted lists.

[10] Future commodity prices (e.g., steel, oil, etc.) and construction methods may dictate other construction alternatives at the time of flowline and sag-pipe replacement. Construction designs will be submitted to FERC for review and approval.

Prior to ground-disturbing activities, PacifiCorp and/or their contractors would:

- identify and protect areas of vegetation to be preserved;
- identify and demarcate grading limits in the field;
- identify existing stabilized construction entrance and laydown areas or construct stabilized entrance and laydown areas to prevent tracking of fines on to adjacent improved roads;
- stabilize all equipment access routes as required to prevent erosion;
- establish a concrete wash-out area away from any watercourse;
- install perimeter sediment control silt fence or staked straw waddles to prevent any stormwater runoff or sediment transport into adjacent waterways;
- identify suitable upland area(s) for onsite water disposal and infiltration of construction dewatering water; and
- hold a pre-construction meeting with contractor team to review project schedule, installation and maintenance of erosion and sediment control BMPs, project inspection and corrective action protocols.

During ground-disturbing activities, PacifiCorp and/or their contractors would:

- stockpile extra straw waddles and silt fence onsite;
- regularly inspect all erosion control BMPs and modify as necessary;
- stabilize exposed soils that would remain unworked for over forty-eight hours; and
- monitor onsite water disposal areas and modify or relocate as necessary to assure that infiltration is occurring.

Following ground-disturbing activities, PacifiCorp and/or their contractors would:

- provide final grading and permanent erosion and sediment controls on all exposed soils;
- remove and properly dispose of all construction materials and waste, including sediment retained by temporary BMPs;
- remove all temporary BMPs as areas are stabilized; and
- revegetate all disturbed soil with native seed and plants, with priority given to locally adapted native species as directed by RR-SNF botany staff.

PacifiCorp's estimated cost for implementation of the ESCP is $15,000 in the first year of the license and $5,000 annually thereafter.

ODFW noted that the DLA did "not include an assessment of the project effects on bedload recruitment below project diversions" (Oregon Department of Fish and Wildlife, 2016). PacifiCorp proposes to place bedload materials dredged from the impoundment upstream of the dam downstream of the dam via a spur road from the flowline vehicle-access bridge to the bypassed reach. This proposal is addressed in additional detail in Section E.6.3.3 for its benefit to fisheries resources.

E.6.1.4 Unavoidable Adverse Impacts

Construction and maintenance of Project access roads have resulted in compaction and loss of soil productivity. These impacts are unavoidable under the no action and proposed Project alternatives. While long-term, these impacts are minor in their impact on both the Project- and analysis-watershed-scale, due to the limited overall percentage of compacted Project roads compared to intact, native soils supporting native plant communities. 15.3 miles of Project access roads account for 55.2 acres (14.7 percent) of the 376.2-acre proposed Project boundary.

E.6.2 Water Resources

E.6.2.1 Affected Environment

Incoming Flows

Two stream sources supply incoming flows directly to the small impoundment behind the South Fork diversion dam: the South Fork Rogue River and Imnaha Creek. Historical records of average daily flows are available for both streams. Average daily flows for the South Fork Rogue River, measured approximately 0.25 miles upstream of the diversion dam at discontinued USGS station number 14330500, are available from October 1, 1931 to September 30, 1949. This gaging station on the South Fork Rogue River encompassed a drainage area of 59.5 square miles (OWRD, 2013). The record of average daily flows at Imnaha Creek extends from October 1, 1933 to September 30, 1949 as measured at discontinued USGS gaging station number 14331000. Located approximately 0.5 miles upstream of the confluence with South Fork Rogue River, the Imnaha Creek stream gage measured flows from a drainage area of 21.60 square miles (OWRD, 2013). A summary of average minimum, mean and maximum historical incoming flows to the Project is provided in Table 5.

The historical data indicate that the baseflow period generally includes September and October, when runoff from precipitation is relatively low and runoff from late-season snowmelt has concluded. In October, when incoming flows are the lowest, the average mean flows in the South Fork Rogue River and Imnaha Creek are 53 cfs and 22 cfs, respectively. The months of November through January are characterized by gradual flow increases, which are associated with seasonal increases in precipitation. Flows remain relatively consistent from January through March, when annual snowfall and snow depths are comparatively high. The runoff period, characterized by increasing snowmelt and decreasing precipitation occurs between April through June (National Weather Service, 2013). Peak incoming flows occur in May, when the average monthly flow in the South Fork Rogue River is 279 cfs and the average monthly flow in Imnaha Creek is 78 cfs. Annual hydrographs of incoming flows suggest that high elevation snowmelt continues through July and August in the South Fork drainage, which encompasses a greater range of elevations than the smaller Imnaha Creek drainage, where runoff from snowmelt is exhausted by the end of June. The combined incoming flows from both sources are summarized as monthly flow duration curves in Table 6. An annual flow duration curve of the total incoming flows to the Project from the South Fork Rogue and Imnaha Creek is provided in Figure 4.

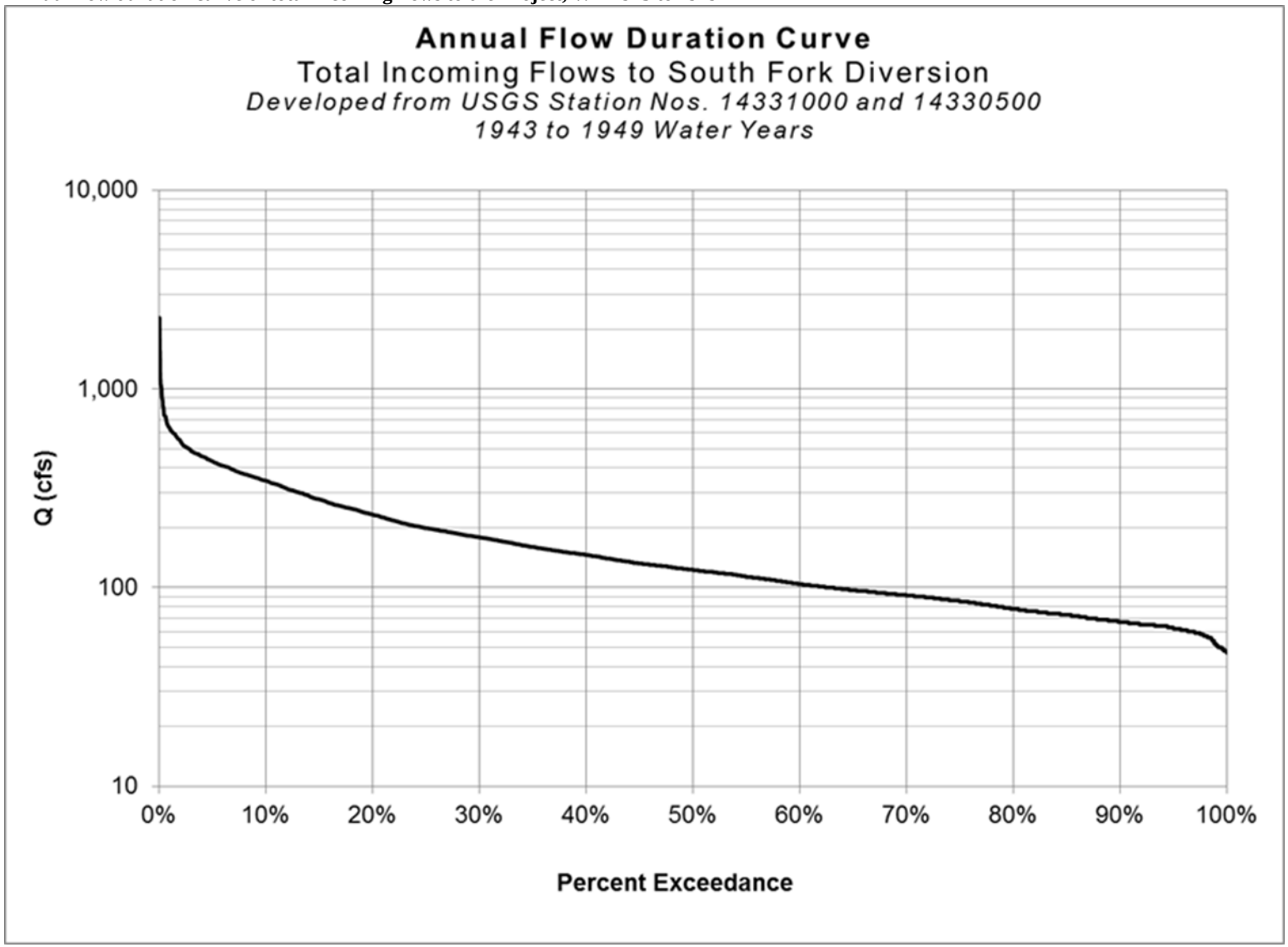
Table 5. Monthly summary of incoming flows from South Fork Rogue River (USGS gage no. 14330500; WY 1932 to 1949) and Imnaha Creek (USGS gage no. 14331000; WY 1934 to 1949).

Month	South Fork Flows (cfs)			Imnaha Creek Flows (cfs)		
	Avg. Minimum	Avg. Mean	Avg. Maximum	Avg. Minimum	Avg. Mean	Avg. Maximum
Oct	46	53	82	20	22	29
Nov	51	80	223	21	29	68
Dec	63	109	350	26	41	109
Jan	73	118	296	32	48	105
Feb	80	109	199	35	47	89
Mar	92	127	219	40	49	65
Apr	125	205	343	48	71	103
May	200	279	447	58	78	115
Jun	139	215	342	41	56	82
Jul	80	101	137	26	32	41
Aug	62	69	80	22	23	26
Sep	51	57	69	21	22	25

Table 6. Monthly flow duration curve for combined incoming flows from South Fork Rogue River (USGS gage no. 14330500) and Imnaha Creek (USGS gage no. 14331000), WY 1934 to 1949.

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
5	108	228	352	391	278	309	533	608	456	200	127	107
10	97	155	258	307	249	266	470	544	408	174	120	101
20	87	117	185	225	199	220	383	464	344	154	109	93
30	80	102	146	180	178	199	335	425	295	142	101	87
40	75	94	125	155	158	181	281	385	258	130	96	80
50	73	86	110	137	147	154	232	356	221	123	90	76
60	69	80	100	118	135	141	202	302	192	116	85	71
70	65	74	92	103	126	131	182	253	174	107	78	67
80	62	69	82	93	109	122	163	201	145	98	72	64
90	59	66	69	88	86	101	130	152	97	73	61	58
95	55	62	65	66	68	88	117	115	84	67	55	51

Figure 4. Annual flow duration curve of total incoming flows to the Project, WY 1943 to 1949



PacifiCorp holds an Oregon Certificate of Water Right (Certificate No. 9688, State Engineer Permit No. 7861) in perpetuity for the purposes of power generation at the Project. The certificate allows for a maximum of 150 cfs to be diverted from the South Fork Rogue River. According to the Oregon Water Resources Department (OWRD) "Water Rights Information Query" website (OWRD, 2012), there are not any existing or proposed uses of Project waters that would impose downstream constraints on Project operations. Other than the Project itself, there are no known in-stream flow uses, existing water rights or pending water rights upstream of the confluence of the Middle and South Fork Rogue River that would be affected by continued operation of the Project. Two water rights were identified upstream of the Project. OWRD holds a water right certificate (No. 72731) for providing stream flows for resident trout by diverting between 13 and 34 cfs (varying by month) from Wallowa Creek to Imnaha Creek upstream of the Project, and Forest Service holds a water right certificate (No. 13528) for 0.11 cfs from Imnaha Creek for domestic use and power development. Neither of these upstream certificates would have an appreciable effect on Project operations.

Water diverted for generation at the South Fork diversion dam does not reenter the South Fork drainage, but is diverted north to the North Fork Rogue River via the siphon from the Prospect No. 3 powerhouse tailrace to the Middle Fork Canal of the Prospect Nos. 1, 2, and 4 Hydroelectric Project, which conveys flows to North Fork Reservoir. Thus, the reach of the South Fork Rogue River that is bypassed by the Project extends downstream from the dam to the terminus of the river at its confluence with the North Fork Rogue, a length of 10.5 miles. Flows downstream of the South Fork diversion remain relatively consistent for approximately two miles. At approximately 2.4 miles downstream from the diversion, springs and groundwater inflows begin to contribute flow to the river. Significant groundwater sources have been identified between 2.8 and 3.5 miles downstream of the diversion (Campbell-Craven Environmental Consultants, 1986). In 2014, PacifiCorp measured groundwater contributions of approximately 26 cfs and 20 cfs in the South Fork bypassed reach at RM 7.0 in June and August, respectively (PacifiCorp, 2015). Additional flow sources further downstream include Buck Creek, Beaver Dam Creek, Smith Creek, the Middle Fork Rogue River, and four unnamed tributaries.

Bypassed Reach Flows

Bypass flows are measured and recorded at USGS gaging station 14332000, located approximately 0.25 miles downstream of the diversion dam at river mile 10.25. The South Fork Rogue basin upstream of the USGS gage covers a drainage area of approximately 83.80 square miles (USGS, 2015). The period of record for the gage is April 1924 to September 1931 and October 1949 to the present. Gage records from October 1949 to September 1983 include both in-stream flow and flows diverted into the Project waterway, and as such, the most reliable records are from October 1984 to the present. The USGS annual water data report (2015) identifies the following stream flow statistics from water years 1950 through 2015: low monthly mean flow of 11.6 cfs (August); high monthly mean flow of 193 cfs (May); and annual mean flow of 73.9 cfs.

Seasonal flow patterns are predictably similar to those described previously for incoming flows. However, average monthly flows in the bypassed reach are lowest in August, as opposed to October, when incoming flows are lowest. The difference in timing of low monthly flows above and below the diversion is attributed to proportionately greater diversions for the duration of August. The annual hydrograph of average monthly flows for the 1984 through 2012 water years is provided in Table 7. The flow record is summarized as monthly average minimum, mean and maximum flows in Table 7 and as monthly flow duration curves in Table 8.

Table 7. Monthly summary of flows in the South Fork Rogue River bypassed reach (USGS gage no. 14332000; WY 1984 to 2012)

Month	South Fork Flows (cfs)		
	Avg. Minimum	Avg. Mean	Avg. Maximum
Oct	46	53	82
Nov	51	80	223
Dec	63	109	350
Jan	73	118	296
Feb	80	109	199
Mar	92	127	219
Apr	125	205	343
May	200	279	447
Jun	139	215	342
Jul	80	101	137
Aug	62	69	80
Sep	51	57	69

Table 8. Monthly flow duration curve for South Fork Rogue River bypassed reach (USGS gage no. 14332000) WY 1984 to 2012.

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
5	84	129	361	376	284	275	389	409	323	115	70	96
10	68	72	187	244	194	209	294	363	275	58	38	76
20	21	46	88	132	102	144	208	289	191	22	17	18
30	16	23	36	86	73	117	175	227	138	17	15	16
40	14	19	19	33	50	88	134	194	104	15	14	15
50	13	15	16	20	29	67	111	164	74	14	13	14
60	12	14	14	16	19	45	89	136	47	13	12	13
70	11	13	13	14	16	23	66	101	25	12	12	12
80	9.0	12	11	13	14	15	42	72	14	11	11	11
90	3.7	5.1	4.6	4.6	10	12	22	19	12	8.8	5.0	4.8
95	2.2	3.8	3.8	3.2	4.2	8.7	15	13	7.9	5.1	4.0	3.7

Water Quality

In 2012, PacifiCorp implemented a study of water quality conditions in the Project vicinity between May 1 and October 31, in consultation with the Oregon Department of Environmental Quality (ODEQ) (Foster, 2013). The study was performed to support an application to the Low Impact Hydropower Institute (LIHI) for certification of low environmental impact from the Project. Multiple water quality parameters were sampled in order to (1) describe existing water quality conditions in the Project area over a natural range of flows and seasonal weather shifts, and (2) evaluate compliance with key water quality criteria identified by Division 41 (Water Pollution) of the Oregon Administrative Rules (OAR). Parameters monitored included temperature, bacteria, dissolved oxygen (DO), pH, total dissolved solids, toxic substances, and turbidity. The monitoring results indicate that compliance with applicable water quality criteria was maintained throughout the monitoring period.

A record of daily minimum and maximum temperatures in the Project vicinity were sampled in 1986. Monitoring sites included South Fork upstream of the diversion (March 13 to June 10 and July 1 to October 8), Imnaha Creek (March 14 to September 20), and the South Fork bypass reach, approximately two miles below the diversion (July 23 to August 14). The available data indicate that the seven-day, rolling average of 24-hour maximum (7DMAX) water temperatures were below Oregon's temperature criteria of 18°C.

Additional support for sustained Project compliance with the state numeric criteria is provided by the absence of any listings of impaired water bodies in the South Fork Rogue River watershed on the Oregon 303(d) list. Section 303 of the Clean Water Act requires states to develop Total Maximum Daily Loads (TMDLs) for water bodies with pollutant levels in excess of established water quality standards. The U.S. Environmental Protection Agency (EPA) approved ODEQ's Rogue River Basin TMDLs on December 29, 2008. The Rogue River Basin TMDLs, which include the South Fork Rogue River Sub-basin, establish temperature and bacteria loads for 109 impaired water bodies. No stream segments in the South Fork Rogue River are currently on the Oregon 303(d) list.

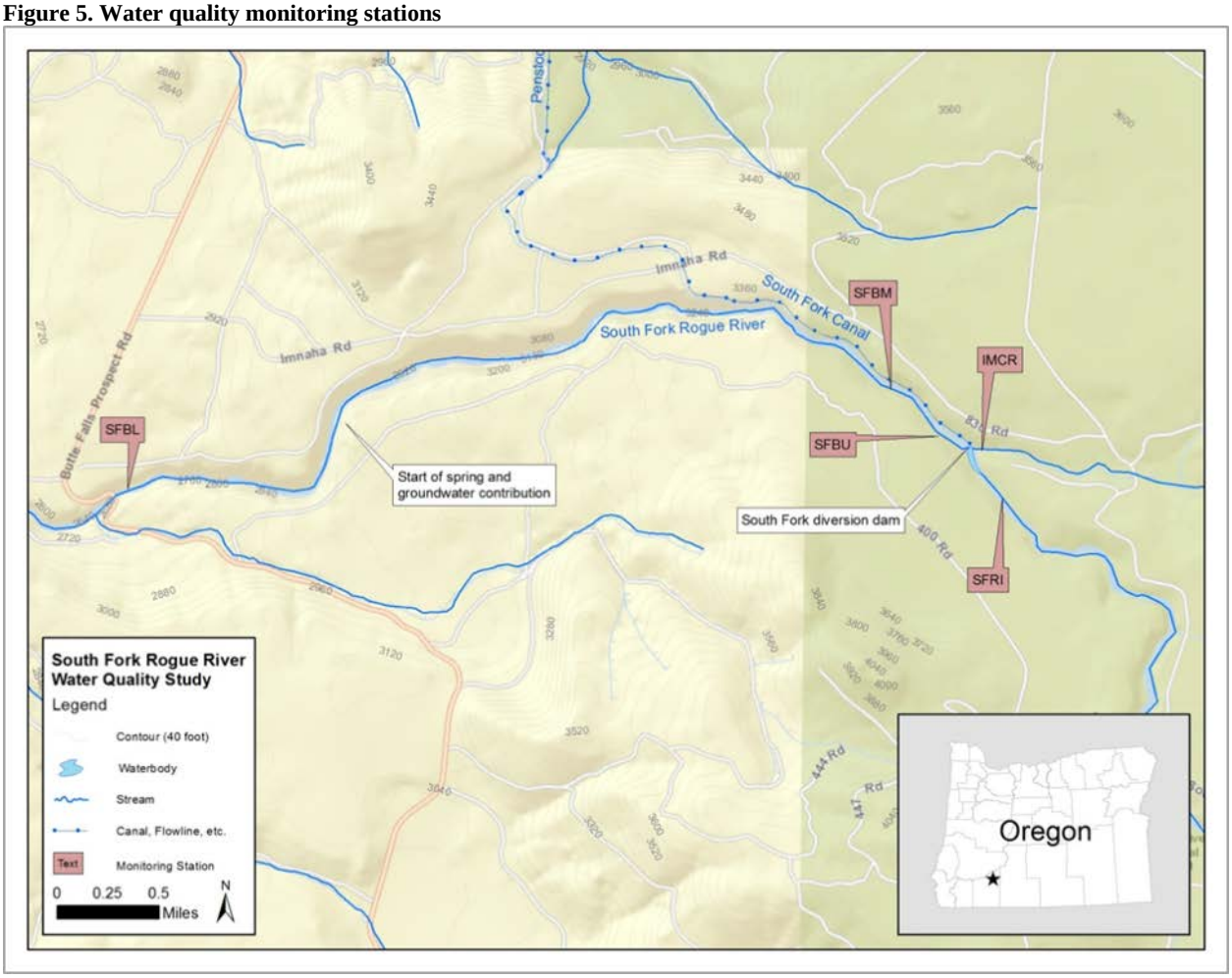
PacifiCorp performed additional monitoring during 2014 and 2015 pursuant to the approved water quality study plan (PacifiCorp, 2014). The Study Area included five water quality monitoring stations (Table 9). The sampling stations, shown in Figure 5, were chosen for their ability to represent conditions in the Study Area and to assess potential Project effects on water quality.

Table 9. Water quality monitoring stations and associated codes.

Sample Site Description	Location	Associated Code
South Fork Rogue River Inflow to Project	RM 10.8	SFRI
Imnaha Creek Inflow to Project	RM 0.2	IMCI
South Fork Bypass Reach - Upper End (Below release point at diversion dam)	RM 10.5	SFBU
South Fork Bypass Reach - Mid-Reach (Above influence of springs and groundwater contribution)	RM 10.0	SFBM

Sample Site Description	Location	Associated Code
South Fork Bypass Reach - Lower End (Below influence of springs and groundwater contributions)	RM 7.0	SFBL

Figure 5. Water quality monitoring stations



Continuous, hourly temperature values were recorded at each of the monitoring stations for 365 days. Continuous, hourly values for dissolved oxygen and pH values were recorded at SFBU, SFBM, and SFBL for 72 hours in May, July, August, September, and October. The results of the study are presented in the following sections.

Water Temperature

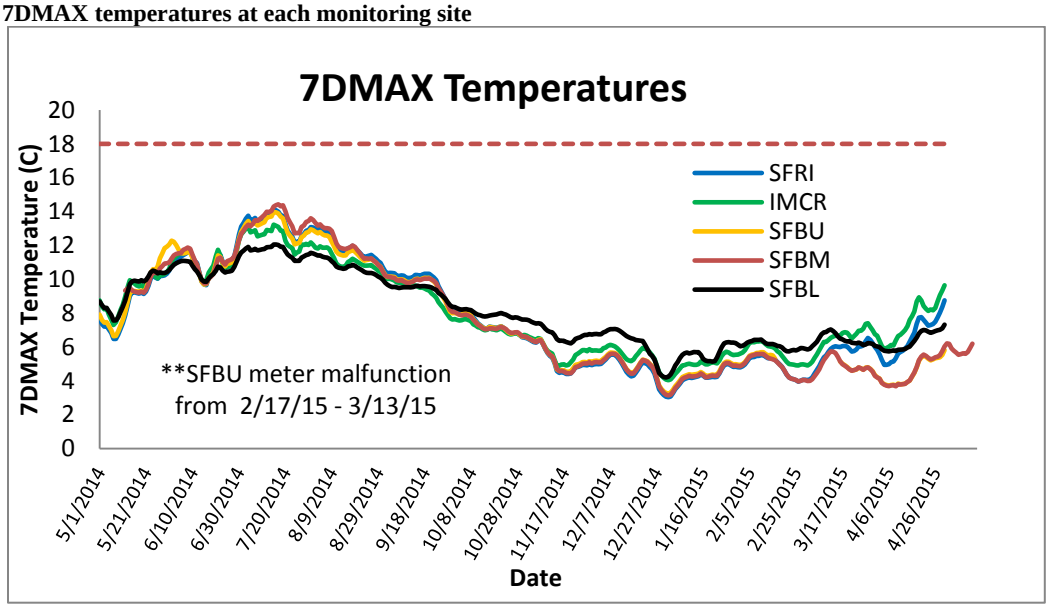
All 7DMAX data from each monitoring site demonstrate compliance with Oregon's numeric criteria of a 7DMAX temperature of 18˚C (Table 10). The largest 7DMAX of 14.43˚C occurred on July 17, 2014 at the SFBM monitoring site. The SFBM site is the furthest site downstream of the diversion dam that is not influenced by groundwater inflows, likely making it the most

susceptible site to increased water temperatures via solar radiation. Given this, the maximum 7DMAX of 14.43˚C at SFBM is still well below Oregon's criteria of 18˚C. All 7DMAX temperatures are shown in graphical form in Figure 6.

Table 10. Summary of 7DMAX temperatures at each monitoring site

Metric	7DMAX Temperatures				
	IMCI	SFRI	SFBU	SFBM	SFBL
Maximum	14.11	13.23	13.97	14.43	12.06
Minimum	3.03	4.04	2.53	3.14	4.20
Average	8.04	7.80	7.60	7.58	8.11

Figure 6. 7DMAX temperatures at each monitoring site



In general, water temperatures immediately downstream of the diversion at SFBU were slightly colder in the summer season and slightly warmer in the winter season than water temperatures in the South Fork Rogue above the diversion at SFRI (Figure 3). This is to be expected as Imnaha Creek inflows appear to be less influenced by seasonal weather patterns (i.e., Imnaha Creek water is colder during summer and warmer during winter) than the temperatures observed at SFRI. During the summer season, and without any significant groundwater or lateral inflows between SFBU and SFBM, PacifiCorp observed SFBM temperatures to be slightly warmer than temperatures at SFBU. Temperatures at SFBL showed a more seasonally stable regime due to groundwater influence.

Dissolved Oxygen

DO levels recorded at each monitoring site demonstrate compliance with Oregon's minimum numeric criteria of 8.0 mg/L (Table 11). Mean hourly DO readings at SFBU, SFBM, and SFBL ranged from 9.55 to 11.82 mg/L throughout the monitoring period of May through October. The month of July had the lowest 72-hour mean DO readings overall with values of 9.85, 9.55, and 10.66 mg/L for SFBU, SFBM, and SFBL, respectively. The minimum observed hourly DO measurement was 9.07 mg/L and was recorded at SFBM on July 10, 2014.

DO readings taken at each site and during each sampling period appeared to have a sinusoidal pattern in which the wavelength is approximately equal to one day. The crests and troughs of the DO curves were inversely proportionate to daily water temperature swings (i.e., the highest daily points of DO coincided with the lowest daily points of temperature, and vice versa). PacifiCorp also suspects that flora and fauna DO production and consumption, respectively, contributed to the observed sinusoidal patterns of DO levels.

Table 11. Mean and range of hourly DO (mg/L) readings for each monitoring site

Site	May Period (2015)		June Period (2014)		July Period (2014)		Aug. Period (2014)		Sept. Period (2014)		Oct. Period (2014)	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range
SFBU	11.30	1.54	10.24	0.97	9.85	1.00	10.14	0.86	10.36	1.13	10.74	0.54
SFBM	10.84	1.17	9.95	0.88	9.55	0.90	10.14	0.84	10.38	0.96	10.51	0.49
SFBL	11.10	0.99	10.41	0.68	10.66	0.85	11.65	0.67	11.82	0.69	10.69	0.41

pH

All pH data gathered at each monitoring site complied with the standard pH of 6.5 to 8.5 for estuarine and fresh waters in the Rogue basin (OAR-340-041-0275, Table 12). Minimum and maximum pH values typically ranged from 7 to 8 at all sites, with some spatial and seasonal variation. The minimum pH reading was 6.92 and was recorded at the SFBU site on May 5, 2015.

Table 12. 24-hour minimum and maximum pH values

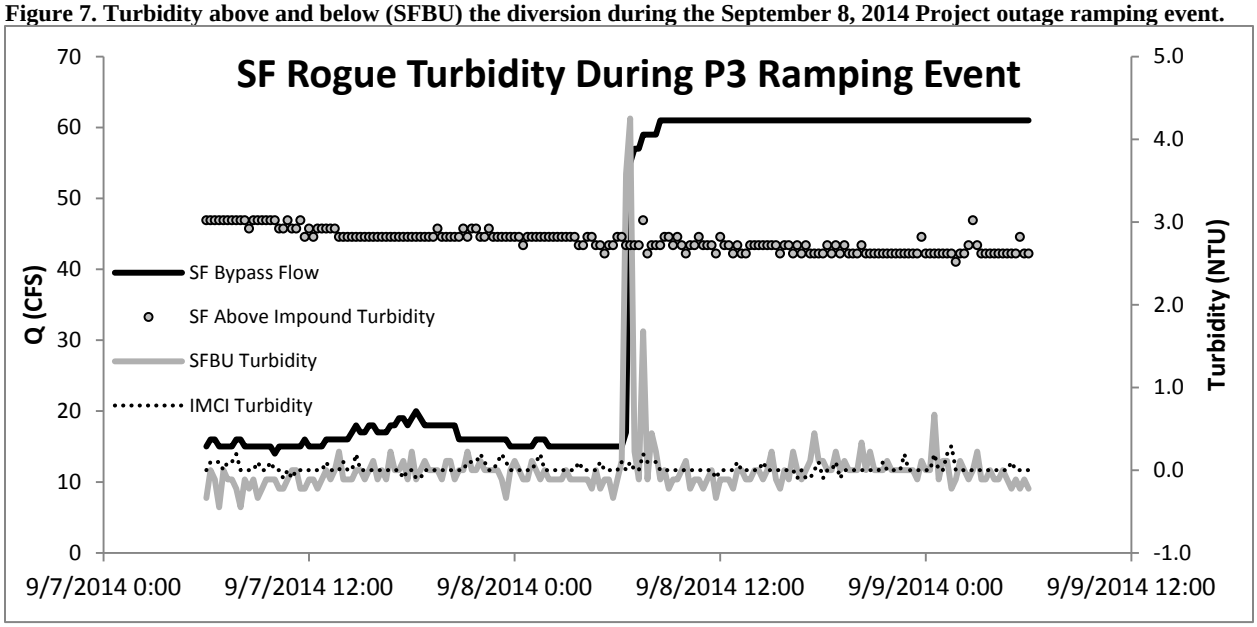
	May Sampling Period						June Sampling Period					
	5/5/2015		5/6/2015		5/7/2015		6/6/2014		6/7/2014		6/8/2014	
Site	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
SFBU	6.92	7.19	6.95	7.22	6.95	7.22	7.66	7.88	7.65	7.89	7.66	7.69
SFBM	7.48	7.62	7.49	7.61	7.50	7.61	7.45	7.81	7.48	7.86	7.47	7.75
SFBL	7.16	7.30	7.17	7.30	7.18	7.29	7.21	7.31	7.20	7.32	7.19	7.33
	July Sampling Period						**August Sampling Period**					
	7/9/2014		**7/10/2014**		**7/11/2014**		**8/28/2014**		**8/29/2014**		**8/30/2014**	
Site	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
SFBU	7.64	8.00	7.68	8.00	7.68	7.92	7.67	7.94	7.65	7.94	7.65	7.95
SFBM	7.45	7.81	7.48	7.86	7.47	7.85	7.50	7.80	7.53	7.81	7.54	7.85
SFBL	7.12	7.31	7.16	7.32	7.17	7.30	7.27	7.40	7.28	7.39	7.29	7.43
	September Sampling Period						**October Sampling Period**					
	9/2/2014		**9/3/2014**		**9/4/2014**		**10/24/2014**		**10/25/2014**		**10/26/2014**	
Site	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
SFBU	7.62	7.88	7.70	7.88	7.69	7.90	7.74	7.87	7.74	7.88	7.74	7.87
SFBM	7.56	7.79	7.56	7.79	7.55	7.79	7.26	7.28	7.25	7.26	7.24	7.26
SFBL	7.28	7.37	7.30	7.39	7.29	7.37	7.53	7.63	7.55	7.64	7.56	7.64

E.6.2.2 Project Effects

Automation of the pressure-relief valve (PRV) and tailrace backwater gate, completed in 2014 and 2016, respectively, to respond to forebay water levels, would reduce the frequency, duration, and volume of forebay spillway discharge (see Section E.4.6.1) and reduce the potential for erosion and/or water quality impacts in Daniel Creek and the Middle Fork Rogue River. Normal operating conditions of the no action and proposed Project alternatives would not result in effects on water quality in Daniel Creek and the Middle Fork Rogue River. Project waters would continue to be discharged to the Middle Fork Canal of the Prospect Nos. 1, 2, and 4 Hydroelectric Project via the sag-pipe.

Project operations under the no action alternative result in turbidity impacts to water resources of a limited magnitude and duration. On September 8, 2014 there was an outage at the Project resulting in closure of the diversion headgate and release of approximately 62 cfs of water (i.e., the full inflow upstream of the diversion) into the South Fork Rogue bypassed reach. Turbidity measurements were recorded during the first 48 hours of this event. These measurements were used to address concerns regarding ramping, or the first initial increase in flows and river stage, and the resulting influence of ramping events on turbidity in the South Fork bypassed reach. There was a slight increase in turbidity at the SFBU monitoring site during the beginning of ramping (Figure 7). Beginning on September 8, 2014 at 06:15, turbidity levels at SFBU increased above the SFBU background condition for 1.75 hours. However, despite the steep increase in turbidity, turbidity levels remained very low throughout the event, peaking at just 4.3 NTU.

Figure 7. Turbidity above and below (SFBU) the diversion during the September 8, 2014 Project outage ramping event.



Shown below in Table 13 are average, minimum, and maximum values of percent changes in turbidity between SFRI and SFBU during each operational ramping phase (i.e., before ramping, during ramping, and after ramping). OAR -340-041-0036 establishes a maximum cumulative increase in natural stream turbidities of 10% compared to background conditions. One data point (on a 0.25 hour interval) exceeded this standard as the turbidity in SFBU was 56.4% greater than that of SFRI.

Table 13. Percent changes of turbidities during ramping of the bypassed reach on September 8, 2014

Metric	Before Ramping	During Ramping	After Ramping
Average Percent Change	-102.4%	-59.6%	-100.6%
Minimum Percent Change	-114.8%	-104.3%	-112.8%
Maximum Percent Change	-92.1%	56.4%	-74.4%

During and after ramping, turbidity cleared quickly, as the turbidity levels were elevated for just 1.75 hours from 06:15 hours to 08:00 hours (peak of 4.3 NTU). Although turbidity standards were violated, the clear water background conditions of the South Fork Rogue above the diversion, the low NTU value of the data point out of compliance (4.3 NTU), and the mathematical nature of percent changes when considering small values suggest that turbidity impacts were negligible.

Normal Project operations do not result in significant adverse impacts to water quality in the South Fork Rogue River and its tributaries crossed by Project waterways. Water quality was monitored during a typical year of operations and maintenance consistent with the no action alternative, and with the exception of ramping in the bypassed reach, the Project did not result in appreciable erosion, sedimentation, and corresponding adverse effects on water quality.

Woodstave pipeline failure may potentially result in sediment mobilization and turbidity in the South Fork and/or Middle Fork Rogue from the flowline or sag-pipe, respectively, but the magnitude of an erosive event from woodstave pipeline failure is dependent on the location of the failure, distance and elevation of the failure from natural waters, and volume of diversion at the time of failure. Flowline failure would result in a low forebay alarm and/or generating unit trip in the Project control system as diverted flows drop off rapidly due to leakage. The alarm would trigger a response from PacifiCorp's Hydro Control Center (HCC), which would contact on-site operators for immediate call-out. Total response time, and therefore approximate duration of leakage, is estimated at one hour: approximately thirty minutes for reduced flows to reach the forebay following initiation of leakage and approximately thirty minutes for an operator to arrive on site and close the headgate to cease diversion and leakage (Jones, 2016).

A failure at the upstream end of the flowline exhibits reduced risk and potential severity of water quality impacts due to flowline proximity to both water surface elevation (vertical distance) and ordinary high water mark (horizontal distance) of the bypassed reach. Risk and potential severity increase with downstream distance as the flowline ascends the canyon and increases the vertical and horizontal distance from the bypassed reach, thereby increasing the volume of sediment exposed to leakage. The potential for flowline failure is primarily a function of rockfall and structural deterioration of the woodstaves. Rock slopes on the inboard side of the flowline have a history of rockfall that have caused major damage to the existing saddles and woodstaves.

Preliminary geotechnical investigations revealed several large rock blocks in the slope that are being undermined and are losing their basal support, primarily in the upper half of the flowline (Conforth Consultants, Inc., 2014). No signs of ancient landslide terrain or global instability were observed during the site reconnaissance of the flowline, and no historically active deep-seated slumps or rotational slides were observed.

Project sag-pipe failure would result in a water differential alarm at Sag-Pipe 3 of the Prospect Nos. 1, 2, and 4 Project, near Red Blanket Creek, when the total diversion in the Middle Fork Canal is less than the sum of the Middle Fork diversion and South Fork diversion. The differential alarm at Sag-Pipe 3 would trigger a response from PacifiCorp's Hydro Control Center (HCC), which would contact on-site operators for immediate call-out. Total response time, and therefore approximate duration of leakage, is estimated at one hour: approximately thirty minutes for reduced flows from the Project sag-pipe to reach Sag-Pipe 3 following initiation of leakage and approximately thirty minutes for an operator to arrive on site and close the Project headgate to cease diversion and leakage (Jones, 2016).

Severity of sag-pipe failure impacts on water quality increases with horizontal distance away from the Middle Fork Rogue channel and exposure of increasing volumes of sediment to leakage. The sag-pipe is not exposed to the same rockfall hazards as the flowline, and the potential for sag-pipe failure is primarily a function of structural deterioration and exposure. Several shallow/surficial slope failures were observed on the southwest slope during geotechnical investigations (Conforth Consultants, Inc., 2014). These appear to be localized features in over-steepened sections of the slope, likely attributed to site grading during construction. A larger (approximately 30-foot wide) slump was observed roughly 30 feet west of the sag-pipe. This feature appears relatively shallow and is likely attributed to saturated ground conditions due to pipe leakage. On the northeast side of the valley, cuts were made to facilitate construction of the sag-pipe. Locally, these cuts are over-steepened; however, no signs of slope failure or excessive erosion were observed. There is noticeably less deterioration and leakage on the northeast side of the river. Pipe footings on both sides of the river exhibit little to no displacement.

E.6.2.3 Proposed Environmental Measures

All of the measured water quality parameters, with the exception of turbidity during ramping events, are within ODEQ state standard criteria, and therefore, PacifiCorp does not propose any environmental measures exclusive to water quality. Establishment of ramping rates and increases in minimum in-stream flows proposed to protect, mitigate, and enhance fisheries resources, would also positively affect water temperature, dissolved oxygen content, and turbidity in the bypassed reach of the South Fork Rogue River by decreasing mobilized sediments during Project shut-downs and increasing the amount of flow and thermal buffering in the bypassed reach, respectively. Implementation of measures proposed to protect, mitigate, or enhance soil resources, in particular, replacement of woodstave pipelines, would subsequently have a positive effect on water resources as a result of decreased risk of erosion and sediment mobilization to streams. PM&E measures for soil and fisheries resources are provided in additional detail in Sections E.6.1.3 and E.6.3.3, respectively.

ODFW proposed "long-term water quality monitoring in order to detect changes cause[d] by Project operations or climate change, especially over the license term" (Oregon Department of Fish and Wildlife, 2016). Proposed Project operations are consistent with the no action alternative with respect to the Project's ongoing and potential impacts on water quality, which are negligible. Potential water quality impacts as a result of climate change are outside of PacifiCorp's control and unlikely to be exacerbated by Project operations. The costs of an on-going water quality monitoring program are estimated at $5,000 per year. PacifiCorp has generated a long-term, thorough record of Project compliance with state water quality criteria and on-going monitoring is unwarranted.

E.6.2.4 Unavoidable Adverse Impacts

Diversion of up to 150 cfs of inflows to the Project for power generation results in long-term, minor, site-specific, unavoidable adverse impacts to water resources. These impacts to water resources are limited by inherently high water quality resource values upstream of the Project and limited Project influence on water resources downstream of the Project due to groundwater augmentation and higher proportions of water budget contributions from other tributaries, including the North and Middle Forks of the Rogue River, to the analysis watersheds. Development and maintenance of Project access roads exposes soils to erosive forces with the potential to mobilize sediments to water resources, thereby potentially increasing turbidity on a local scale.

E.6.2.5 Cumulative Effects

The incremental water quality impacts of the Project when added to other activities that may cumulatively affect water quality are negligible within the analysis watersheds during all past license terms and the proposed Project term. There are no Clean Water Act Section 303 (d) impaired water bodies, irrigation districts, confined animal feeding operations, or other point sources of pollution within the analysis watersheds (ODEQ, 2008). Roads and timber harvest have been identified as the human processes most responsible for impacts to water quality in the watershed via sedimentation (USDA Forest Service, 1998).

The increased demand for lumber during World War II (ca. 1939-1945) improved the economic viability of building roads and conducting timber operations in previously roadless areas within the analysis watersheds. National Forest timber began to be harvested in the 1940s and achieved peak rates of expansion in the 1950s (USDA Forest Service, 1998). Impacts from these operations were exhibited by extensive channel damage and water quality impacts that were experienced in areas downstream of widespread timber harvest following a flood in December 1964 (NOAA, 2014). In 1994, with adoption of the Record of Decision for the Northwest Forest Plan (USDA and USDI, 1994), much of the analysis watershed was designated as "Late-Successional Reserve" and was excluded from logging operations. Continued implementation of the restoration strategy of the Northwest Forest Plan would result in a net decrease of roads, an

increase in vegetation cover, a reduction in sediment yield, and an increase in water quality (USDA Forest Service, 1998).

Streams within the analysis watersheds are naturally cool and clear due to large contributions of cold groundwater and dense riparian canopy cover to provide thermal buffering. Under normal operations typified by the no action alternative, the Project has not significantly impacted water quality within the analysis watersheds. As described in the water quality study report, minor Project impacts within the bypassed reach alone are ameliorated by groundwater contributions approximately three river miles downstream of the diversion. Implementation of the environmental measures proposed to address impacts to soil and fisheries would improve water quality through reduced leakage-induced erosion and resulting sedimentation from woodstave pipelines, improved road maintenance schedules and procedures, adherence to best management practices for limiting sediment mobilization to water during ground-disturbing activities, increased flows in the bypassed reach to provide additional thermal buffering, and established ramp rates to reduce sediment mobilization during Project outages. Therefore, the cumulative impact of the proposed Project would likely have a positive effect on the cumulative impacts to water quality within the analysis watersheds.

E.6.3 Fisheries Resources

E.6.3.1 Affected Environment

Fish Habitat

In August 2014 Siskiyou Research Group (SRG) conducted an aquatic habitat inventory and aquatic biota survey of the South Fork Rogue River pursuant to the requirements of the Stream Inventory Study (Section 4.1) of the revised Fish Community and Habitat Study Plans (Study Plan) for the Project. SRG followed methods described in the Forest Service Region 6 (Pacific Northwest) Stream Inventory Handbook (2014). The survey began approximately 500 feet upstream of the South Fork Rogue confluence with the Middle Fork Rogue and extended upstream 13.3 miles. The aquatic biota surveys were performed to determine fish species presence and distribution, relative abundance, and to correlate fish densities with habitat data at the reach scale.

The Study Plan identified two study reaches on the South Fork Rogue River for aquatic habitat inventory and fish community surveys. The first Study Plan reach extends from the confluence of the South Fork Rogue River with the Middle Fork Rogue River (RM 4.5) upstream six miles to the South Fork Dam (RM 10.5). The second Study Plan reach extends 0.5 miles upstream of the South Fork Reservoir (RM 10.5 to RM 11.0). Within these two Study Plan reaches SRG identified five separate study reaches in accordance with Stream Inventory Handbook guidelines, with each reach sharing relatively uniform physical attributes such as flow, gradient, habitat width, substrate, and canyon morphology (Stream Inventory Handbook 2014). SRG identified three reaches in the six-mile segment downstream of the South Fork Dam (RM 4.5 to RM 10.5). A fourth reach was identified as the South Fork Reservoir, but no data was collected in this non-

riverine feature. A fifth reach was located immediately upstream of the South Fork Reservoir. The lower three reaches (from Middle Fork confluence to South Fork Dam) were surveyed to provide data on the river section directly affected by the Project; the fifth reach, located immediately upstream of the project, was surveyed to provide aquatic habitat and fish population information to fill a data gap and provide a basis for comparison with Project-affected waters.

The geomorphology of Reach 1 through Reach 3 (RM 4.5 to RM 10.5) was characterized, with limited exceptions, by steeply sloped and deeply incised basalt canyons and bedrock gorges etched into a gently sloped landscape derived from volcanic deposition. The stream channel was stable and controlled by bedrock or colluvial boulders. Stream gradients averaged three to four percent, and aquatic habitats consisted of deep-channeled, boulder- and cobble-dominated rapids, deep plunge pools, scour pools, and bedrock trench pools. Channel substrate was dominated by coarse particles (large cobble and boulders) and lacked small sediment (sand, gravel, and small cobble). Stream and channel morphology was characterized by pool-drop sequences within a confined, low sinuosity channel. Large woody material (LWM) was not abundant in the lower section (17 to 28 pieces/mile) and was influencing channel morphology in very few places. Instream wood was found as scattered pieces and wood associated with log jams. All instream wood was naturally recruited. Three waterfalls were identified in Reach 1 ranging in height from four to ten feet. The ten foot high waterfall was estimated to be an upstream fish passage barrier at low stream flows.

The geomorphology of Reach 5 (RM 10.5 to RM 17.3) was characterized by a gently to moderately sloped, V-shaped, colluvial canyon, and flat-floored, alluviated canyon. Map- and field-estimated valley widths ranged from eighty feet to greater than 200 feet, but generally valley widths were 100 to 200 feet. Stream gradients averaged one percent to two percent and the most common aquatic habitats were long rapids, riffles, and large mid-channel scour pools. Substrate estimates and Wolman Pebble counts indicated a gravel and cobble dominated channel with substantial amounts of sand in both fast water (rapids) and slow water (pools). LWM was moderately abundant in Reach 5 (68 pieces/mile) and was found as scattered pieces and in large wood complexes. These wood jams were influencing channel morphology by retaining large amounts of sediment (sand, gravel, and small cobble) and by creating and maintaining side channel habitat. The large wood jams observed in Reach 5 indicated a system that experiences occasional flooding from rain-on-snow as a result of a large portion of this watershed being located in the transient snow zone (elevation range 3,500 to 5,000 feet). No fish passage barriers were observed in Reach 5. A summary of the stream inventory data is presented below in Table 14. Additional detail is provided in the Initial Study Report.

The riparian habitat and adjacent forest in the lower section (with the exception of upper Reach 3) was located on privately owned corporate timberland and consisted of early seral stands of Douglas-fir regenerating from past harvest. Specifically, the riparian vegetation consisted of an overstory of small tree class Douglas-fir (*Pseudotsuga menziesii*) and western hemlock (*Tsuga heterophylla*) as the primary overstory species. Understory species included willow (*Salix spp.*), red alder (*Alnus rubra*), vine maple (*Acer circinatum*), big leaf maple (*Acer macrophyllum*), Pacific madrone (*Arbutus menziesii*), and Pacific ninebark (*Physocarpus capitatus*). Small stands or pockets of mature Douglas-fir and western hemlock were observed in the inner riparian

zone in areas that appeared difficult to access for timber harvesting. Limited areas exhibited a narrow strip of riparian vegetation buffering a recent clear-cut of the outer riparian trees. The large amount of timber harvesting that has occurred within the riparian zone and in the adjacent forest has reduced the potential recruitment of LWM in the lower section.

The riparian forest occupying Reach 5 is located on public land and is characterized as a mature mixed conifer forest consisting of large and mature seral class Douglas-fir, western hemlock, white fir (*Abies concolor*), mountain hemlock (*Tsuga mertensiana*), and Engelmann spruce (*Picea engelmannii*). Other riparian species observed in Reach 5 include Pacific yew (*Taxus brevifolia*), red alder, willow, vine maple, ponderosa pine (*Pinus ponderosa*), chinquapin (*Chrysolepis chrysophylla*), and western white pine (*Pinus monticola*). The large and mature class trees dominating the riparian zone contributed to the continuous and sustainable recruitment of instream LWM in Reach 5.

Five tributaries were identified as contributing one percent or greater of the volume of South Fork Rogue River at the tributary confluence point. Two tributaries were fish-bearing and one tributary was considered likely fish bearing but this was not confirmed at the time of the survey. Many springs, both seen and unseen contribute to South Fork Rogue River but were not identified as tributaries due to their dispersed nature (i.e. multiple source points, no defined tributary channel, and many times individual springs contributed less than one percent of the volume of South Fork Rogue at that specific point but cumulatively contributed a substantial amount of water). Table 15 provides a summary of the information collected at the mouth of each tributary.

Fish Community

Fish community studies were conducted by SRG on the South Fork Rogue River during August 2014. Estimates of fish abundance by size-class, species assemblage, and species distribution were made using visual estimation (mask and snorkel) and electrofishing sampling methods. The two techniques were conducted in independent studies and were not coordinated for evaluation of efficiency. Visual estimate data were correlated to meso-scale habitats (USDA 2014) using data collected in a 2014 Fish Habitat Study (Siskiyou Research Group, 2015). Species abundance was reported as a function of area (fish/yd2) derived from measured aquatic habitat data, and as a function of time (seconds) in a capture per unit of effort (CPUE) calculation (n/sec).

Electrofishing was conducted opportunistically by spot sampling in fixed-reach segments, and fish abundance was reported as CPUE. Captured fish were measured for mass and length. Electrofishing efforts did not provide data on area sampled in the fixed-reach segments so a derivation of fish density as a function of area was not possible. Rather, aquatic habitat data collected during the 2014 Fish Habitat Study was used descriptively to characterize the fixed-reach segments.

Table 14. Summary of South Fork Rogue River stream attributes by study reach

Reach	1	2	3	5
Stream Order	4	4	4	4
Rosgen Channel Type	B	B	F	B
Valley Segment Type	Bedrock Canyon	Colluvial Canyon	Colluvial Canyon	Alluviated Canyon
Valley Form	Narrow Box and V-Shaped	Narrow V-Shaped	Narrow V-Shaped	Moderately wide V-shaped/Flat-floored
Valley Width Estimate (ft)	105	135	105	225
Measured Length (miles)	1.70	1.68	3.09	6.83
Mapped Gradient (%)	3.79	3.2	4	1.7
Measured Sinuosity	1.00	1.02	1.01	1.03
Entrenchment Ratio	1.21	1.63	1.28	1.34
Bankfull Width:Depth	29.76	27.12	33.80	35.76
Ave. Bankfull Width (ft)	61	46	49	53
Ave. Bankfull Depth (ft)	2.1	1.7	1.4	1.5
Ave. Floodprone Width (ft)	72	75	63	71
Ave. Floodprone Depth (ft)	7.7	5.5	5.4	5.6
Ave. FW Width (ft)	40	38	35	43
Ave. FW Depth (ft)	1.7	1.6	1.6	1.2
$SW_{(area)}:FW_{(area)}$	0.73	0.68	0.43	0.38
SW Units / Mile	21	25	25	14
Ave. Residual SW Depth (ft)	5.4	3.1	3.1	2.4
% SW Units	40	38	29	27
Bank Instability (% reach length)	1.73	0	2.29	1.95
# Special Case Units	0	0	0	0
Dominant / Subdominant Substrate	Boulder / Cobble	Boulder / Cobble	Boulder / Cobble	Gravel / Cobble
D_{50} - 1 (mm)	89	170	196	80
D_{84} - 1 (mm)	>1100	750	719	283
D_{50} - 2 (mm)	147	318	117	72
D_{84} - 2 (mm)	480	1460	615	705
Dominant / Subdominant Riparian Veg. Class	ST, SP / LT	ST, SP / LT	ST, SP / LT	LT, MT / ST
Overstory / Understory Riparian Species	CD,CH / HB,HA,HW	CD,CH / HB,HA,HW	CD,CH / HB,HA,HW	CD,CH HA,HW,CY,CH,HV
SWM / Mile	18.2	15.5	25.2	62.8
MWM / Mile	1.8	1.8	2.9	5.3
LWM / Mile	0.6	0	0.3	0.3
Hi/Lo H_2O Temp. (^{0}C)	12/9	10/9	14/8	10/7
Dominant Cover Type for Fish	Substrate Depth	Substrate Depth	Substrate, Depth	Substrate, Depth LWM
Fish Species Observed	ONMY, ONCL SAFO	ONMY, ONCL SAFO	ONMY, SAFO	ONMY, ONCL SAFO
Salmonid Density (fish/yd^2)	0.063	0.075	0.049	0.036

Table 15. Summary of major tributaries within the South Fork Rogue River stream inventory area.

Tributary Number	Reach #	Est. Flow Contrib.	Fish Bearing?	Temp (°C)	Time	Gradient at Mouth	Enters From	Tributary Name
1	1	15%	Yes	10	1429	11%	Left	Buck Creek
2	2	25%	No	5	1116	100%	Left	ground water spring
3	5	1%	No	5	1451	44%	Left	ground water spring
4	5	17%	Poss	9	1427	24%	Right	Nichols Creek
5	5	25%	Yes	8	1210	9%	Right	Big Ben Creek

Study areas in the South Fork Rogue River were located (1) downstream of the South Fork Dam to the confluence with the Middle Fork Rogue River, referred to as the bypass reach (mapped River Mile (RM) 4.4 to RM 10.5), (2) upstream of the dam in the South Fork Rogue River, (3) in Imnaha Creek, a large tributary that empties directly into the South Fork Impoundment, and (4) within the South Fork Impoundment. Fish species identified in the snorkel survey method include rainbow trout (*Oncorhynchus mykiss*; ONMY), cutthroat trout (*O. clarkia*; ONCL), non-native eastern brook trout (*Salvelinus fontinalis*; SAFO), and sculpin (*Cottus spp.*). Fish species identified in the electrofishing method include rainbow trout and eastern brook trout.
In the bypass reach, a fish community population of 979 salmonids was visually estimated (snorkel survey method) in forty-two aquatic habitats sampling a total measured area of 16,194 yd^2 (13,540 m^2), in a cumulative elapsed time of 212 minutes (12,720 seconds), for a calculated fish density of 0.060 fish/yd^2 (0.072 fish/m^2), and a CPUE of 0.077 fish/sec. Visual estimation of the fish community upstream of the South Fork Impoundment was conducted between mapped RM 10.6 and RM 17.3 (measured reach length of 6.83 miles). A fish population of 571 salmonids was visually estimated in twenty-eight aquatic habitats sampling a total measured area of 15,726 yd^2 (13,149 m^2), in an elapsed time of 123 minutes (7,380 seconds), for a fish density of 0.036 fish/yd^2 (0.043 fish/m^2), and a CPUE of 0.077 fish/sec.

Electrofishing was conducted in two 750-foot fixed-reach segments located in the bypass reach, specifically (1) immediately downstream of the South Fork Dam, and (2) downstream of the USGS stream gaging station located at mapped RM 10.3. Combined data from the two fixed-reach segments located in the bypass reach reported the capture of fifty-three salmonids in 2,429 seconds of electrofishing effort for a calculated CPUE of 0.022 fish/sec. One 600-foot fixed-reach segment was electrofished upstream of the South Fork Impoundment and reported the capture of ten salmonids in 1,040 seconds for a CPUE of 0.0096 fish/sec. A fourth fixed-reach segment was located in the lower 400-foot section of Imnaha Creek and reported the capture of twenty-two salmonids in 830 seconds of electrofishing effort for a CPUE of 0.027 fish/sec.

Fish abundance was significantly greater as reported by the snorkel survey method, likely as a result of a greater sample size and due to the limitations of operating a backpack electrofisher in a deep complex channel in waters with low electrical conductance. Tabular summaries of the snorkel and electrofishing surveys are presented in Table 16, Table 17, and Table 18.

Table 16. Summary of fish species, size-class, and abundance by slow-water (SW) and fast-water (FW) habitat types in the South Fork Rogue River bypassed reach (RM 4.4 -10.5)

Reach ID	Habitat Type	% of Area Sampled	Species Code	Tally by Size Class			Total Salmonids	Salmonid Density (fish/yd^2)						
				1	2	≥3		By Habitat Type	ONMY	ONCL	SAFO	Size Class 1	Size Class ≥2	Total
Bypass Reach	SW	22	ONMY	124	580	51	839	0.760	0.055	0.003	0.002	0.010	0.050	0.060
			ONCL	0	24	21								
			SAFO	2	29	8								
	FW	6	ONMY	44	86	8	140	0.027						
			ONCL	0	0	1								
			SAFO	0	0	1								
Salmonid Size Class Totals				170	719	90	979	0.060						

Size Class Definition: 1 = 0 to 100mm, 2 = 100mm to 200mm, 3 ≥ 200mm

A PacifiCorp aquatic scientist sampled the impoundment with a hook and line on July 8, 2014. Nine rainbow trout with an average fork length of 6.67 inches (169 millimeters (mm)) were caught using small rooster tail lures in forty minutes (2,400 seconds) of angling for a CPUE of 0.0038 fish/sec. No brook trout were caught. On April 18, 2015, SRG used a team of two snorkelers to survey the impoundment and results indicate very low fish densities. The entire impoundment was visually searched in a total snorkel time of forty-four minutes (2,640 seconds) and reported six rainbow trout in the size class 100 mm to 200 mm for a CPUE of 0.0023 fish/sec. A second snorkel survey effort was conducted in the afternoon on the same day and two snorkelers spent a total of fifty minutes (3,000 seconds) systematically searching the impoundment. Two rainbow trout in the size class 100 mm – 200 mm were observed for a CPUE of 0.00067 fish/sec. No brook trout were observed in the snorkel survey.

On October 1 and 21, 2014, The Cow Creek Tribe of Umpqua Band of Indians conducted two days of Pacific lamprey (Lampetra tridentata) surveys in the Project Area following the Umpqua Basin Lamprey Protocol (USGS, Forest and Rangeland Ecosystem Science Center, 2013). During the October 1, 2014 survey, the crew electrofished for lamprey presence/absence downstream of the South Fork Dam. Lamprey were not detected within the stream reach sampled during the survey. In addition the crew surveyed upstream of the dam at the impoundment where Imnaha Creek enters the South Fork Rogue River. The shallow shoreline was electrofished from the bank, due to sediment depth. Lamprey were not detected in the area electrofished at the impoundment. During the October 21, 2014 survey, the crew electrofished for lamprey presence/absence upstream of the South Fork Dam. Lamprey were not detected within the stream reach sampled during the survey.

Anadromous fish species are precluded from the analysis watersheds by Jess Dam approximately 22 river miles southwest of the Project. There were no federally- or state-listed fish species observed in the Project bypassed reach.

Table 17. Summary of fish species, size class, and abundance by slow-water (SW) and fast-water (FW) habitat types by survey reach within the South Fork Rogue River bypassed reach.

Reach ID	Habitat Type	% of Area Sampled	Species Code	Tally by Size Class			Total Salmonids	Salmonid Density (fish/yd^2)						
				1	2	≥3		By Habitat Type	ONMY	ONCL	SAFO	Size Class 1	Size Class ≥2	Total
1	SW	25	ONMY	28	229	25	322	0.081	0.056	0.006	0.001	0.006	0.057	0.063
			ONCL	0	16	18								
			SAFO	0	5	1								
	FW	7	ONMY	6	20	3	29	0.019						
	Salmonid Size Class Totals			34	270	47	351							
2	SW	16	ONMY	28	194	10	247	0.100	0.071	0.003	0.001	0.010	0.064	0.075
			ONCL	0	8	3								
			SAFO	0	2	2								
	FW	7	ONMY	14	38	3	57	0.036						
			ONLC	0	0	1								
			SAFO	0	0	1								
	Salmonid Size Class Totals			42	242	20	304							
3	SW	24	ONMY	68	157	16	270	0.058	0.045	0.000	0.004	0.014	0.035	0.049
			SAFO	2	22	5								
	FW	4	ONMY	24	28	2	54	0.027						
	Salmonid Size Class Totals			94	207	23	324							
5	SW	19	ONMY	157	250	25	445	0.050	0.053	0.000	0.001	0.014	0.023	0.036
			SAFO	3	10	0								
	FW	6	ONMY	53	66	4	126	0.018						
			ONCL	0	1	0								
			SAFO	0	1	1								
	Salmonid Size Class Totals			213	328	30	571							

Size Class Definition: 1 = 0 to 100mm, 2 = 100mm to 200mm, 3 = >200mm

Table 18. Summary of fish density and CPUE calculated by species and reach segments for the snorkel and electrofishing survey reaches.

Snorkel Survey CPUE (fish/yd^2)	**Fish Species**	**Bypass Reach (RM 4.4 to RM 10.5)**				**Above Reservoir**	**Imnaha Creek**
		Reach 1	**Reach 2**	**Reach 3**	**Bypass Reach**	**Reach 5**	**Reach 1**
		RM 4.4 - RM 6.1	**RM 6.1 - RM 7.7**	**RM 7.7 - RM 10.5**	**Total**	**RM 10.6 - RM 17.3**	**RM 0.0 - RM 1.74**
	ONMY	0.056	0.071	0.045	0.055	0.035	0.011
	ONCL	0.006	0.003	0.000	0.003	0.000	0.018
	SAFO	0.001	0.001	0.004	0.002	0.001	0.012
	TOTAL	0.063	0.075	0.049	0.060	0.036	0.041
Snorkel Survey CPUE (fish/sec)	**Fish Species**	**Bypass Reach (RM 4.4 to RM 10.5)**				**Above Reservoir**	**Imnaha Creek**
		Reach 1	**Reach 2**	**Reach 3**	**Bypass Reach**	**Reach 5**	**Reach 1**
		RM 4.4 - RM 6.1	**RM 6.1 - RM 7.7**	**RM 7.7 - RM 10.5**	**Total**	**RM 10.6 - RM 17.4**	**RM 0.0 - RM 1.74**
	ONMY	0.074	0.098	0.053	0.07	0.075	N/A
	ONCL	0.008	0.004	0.000	0.004	0.000	N/A
	SAFO	0.001	0.002	0.005	0.003	0.002	N/A
	TOTAL	0.084	0.103	0.058	0.077	0.077	N/A
Electro-fishing CPUE (fish/sec)	**Fish Species**	**Bypass Reach (RM 4.4 to RM 10.5)**				**Above Reservoir**	**Imnaha Creek**
		Reach 1	**Reach 2**		**Bypass Reach**	**Reach 3**	**Reach 4**
		RM 10.33	**RM 10.58**		**Total**	**RM 10.69**	**RM 0.0**
	ONMY	0.015	0.023		0.019	0.007	0.011
	SAFO	0.002	0.004		0.003	0.003	0.016
	TOTAL	0.018	0.027		0.022	0.010	0.027

E.6.3.2 Project Effects

Fish Passage

The Project includes a 172-foot-long, 24-foot-high concrete diversion dam with a 98-foot-long un-gated ogee spillway, and both upstream and downstream fish passage facilities. The upstream fish passage facility (i.e., fish ladder) includes an 86-foot-long, 15-pool, concrete, pool-and-weir-type fish ladder. This ladder was originally constructed in 1931 and has been modified twice, first in 1973 and again in 1996. The current downstream fish passage facility (i.e., fish screen) was constructed in 1996 to prevent fish from entrainment within the Project waterway and generating unit. This downstream passage facility consists of a 0.25-inch wedge-wire, inclined plane fish screen with an effective surface area of 193.3[11] square feet located within the Project waterway. Baffles were installed after the 1998 hydraulic assessment to create a more uniform flow through the screen. In June of 2015, PacifiCorp installed an improved baffle design, which permanently mounted the baffles behind the screen. Fish moving down the intake canal and past the fish screen are directed to an 18-inch diameter bypass pipe that transports them to Pool 6 of the fish ladder. Flow through the bypass pipe is used to increase attraction flow to the fish ladder.

The fish screen rotates at its mid-point along the horizontal axis from the engaged, inclined position to a plane (i.e., flat) or declined position to facilitate debris removal via backwashing the screen face with diverted canal flows. Cleaning cycles are automated based on the differential between water surface elevations upstream and downstream of the fish screen as indicated by ultrasonic level loggers that transmit data to programmable logic controllers (PLCs). When debris accumulates on the screen, the water surface elevation upstream of the screen increases, and at a defined differential set point, the PLC initiates a back-flush cycle. The screen has a position indicator, which can be monitored remotely for indication of screen position on the spectrum from fully-seated and screening ("0") to declined ("100").

In response to ODFW's comments on fish screen cleaning cycles (Oregon Department of Fish and Wildlife, 2016), PacifiCorp reviewed the fish screen position indicator data for the last four water years (2013-2016) in PI System software (OSIsoft, 2016). A single cleaning cycle takes approximately 6.5 minutes to return to the engaged position. Five-minute samples of real-time PI data were utilized to estimate the number and duration of cleaning cycles by sorting for non-zero (i.e., not engaged) position indications. The screen may remain in the engaged position for days or weeks at a time without an automated cleaning cycle; the screen was completely engaged through the months of August and September 2016. At times of high debris loading, the screen may cycle multiple times per hour. On average, the screen experiences 286.7 cleaning cycles per year (0.79 cycles per day). The highest average frequency of cleaning cycles is observed in March (n=57.3); the lowest average frequency of cleaning cycles is observed in September (n=4.0). The screen is most frequently placed in plane mode during frazil ice conditions in

[11] The total effective screen area includes only the area of screen available to pass flow. This does not include structural obstructions such as the 2.5-inch wide solid steel and rubber gasket perimeter.

January and February (1.67 events per month on average) and debris-laden high flows in May and June (1.67 events per month on average). The amount of time in plane mode varies widely from 30 minutes for pressure washing to several days to avoid icing. Plane mode was utilized for an average of 451.83 hours per year. The screen was engaged for an average of 94.4% from WY 2013 through WY 2016. In WY 2014, the screen was engaged for 99.1% of the year.

If the fish screen position indicator does not return to the fully-seated screening position following a cleaning cycle and the water surface differential does not initiate a subsequent cleaning, the SCADA system provides an alarm to the Hydro Control Center. On-site operators are then called out to the site to investigate the screen position and attempt to return the screen to the fully-seated screening position. Minor obstructions (e.g., rocks, moss, twigs, etc.) of the screen seating are generally flushed from the obstructing position with a manual cleaning cycle.

Physical and biological evaluations of the fish passage facilities were conducted in 2014, 2015 and 2016 pursuant to the approved Study Plan and modifications identified by the FERC study plan determination. Tests were targeted for periods when the total river flows approximated the 5th and 95th percentile exceedance flows of 444 cfs and 60 cfs, respectively. The total river flows are determined by adding the flow through the Project penstock to the flow measured downstream of the Project at the U.S. Geological Survey gaging station 0.25 miles downstream from the dam (USGS Gage 14332000). The five and ninety-five percent exceedance flows represent two different hydraulic regimes for the diversion and fish passage facilities.

For the low flow regime in the no action alternative, experienced when flows are less than or equal to 160 cfs, the total river flow would enter the diversion headgate and fish ladder exit, with no flow passing over the Project spillway. The diversion canal flow control gates, one upstream and a second downstream of the fish screen, are manipulated to maintain a minimum flow of 10 cfs in the fish ladder at and below Pool 6 (or the full Project inflow if less than 10 cfs). The remaining flow, up to the maximum water right of 150 cfs, is passed into the diversion canal downstream of the fish screens.

For the high flow regime in the no action alternative, experienced when inflow to the Project is greater than 160 cfs, flow in excess of the 150 cfs water right and the minimum 10 cfs in the fish ladder at and below Pool 6, would be passed over the spillway, with minor increases in the fish ladder and screen bypass pipe flows as dictated by the Project impoundment water surface elevation and the ladder and bypass operational requirements to deliver safe fish passage conditions.

Physical Evaluation

Physical evaluations targeting the five and ninety-five percent exceedance flows were conducted on six days between June 1, 2014 and February 1, 2016 (Table 19).

Table 19. Summary of fish passage facilities physical evaluations

Date	Targeted Flow Condition	Approx. Project Inflow (cfs)	Measured Parameters
6/1/2014	Low	160	Ladder Jump Heights
7/2/2014	Low	118	Remaining Low Flow Ladder Measurements
8/20/2014	Low	67	Pre-Maintenance Screen Hydraulics
1/17/2015	High	226	Pre-Maintenance Screen Hydraulics
1/18/2015	High	680	Ladder Measurements
2/1/2016	High	235	Post-Maintenance Screen Hydraulics

Fish Ladder

The upstream fish ladder exit consists of two submerged rectangular openings (2.5 ft. x 1.3 ft) oriented near the bottom of the river. Each exit orifice is controlled by a manual sluice gate. The average exit velocity was calculated by dividing the flow through the exit by the open orifice area. During the low flow measurements, one orifice was fully open and the other was closed. Under this low flow condition, the velocity in the fish ladder exit was estimated to be 0.7 ft/s. During the high flow measurements one orifice was fully open and the second gate was opened approximately 7.5 inches[12]. Under this high flow condition, the increase in open area was estimated to increase from 3.2 sq. ft. to 4.03 sq. ft., with a resulting exit velocity of 2.0 ft/s.

The flow in the upper fish ladder (Pools 7 through 15) was estimated using weir rating curves. During low flows, the flow in the upper fish ladder was estimated to be 2.2 cfs. At high flows the upper fish ladder flow increased to 8.0 cfs. The bypass flow from the fish screen enters the fish ladder in Pool 6 increasing the flow in the lower fish ladder. During low flow, non-spill conditions, all of the flow in the South Fork bypassed reach below the dam passes through the fish ladder. Based on the flows in the South Fork bypassed reach, the flow in the lower fish way during low flow conditions of the study was 14 cfs. There is flow over the dam during high flow conditions; a flow of 21.3 cfs flow was estimated during high flow conditions of the study in the lower fish ladder based on a combination of flow from the upper fish ladder and the fish screen bypass pipe.

Table 20 and Table 21 below summarize the findings of the fish ladder hydraulic studies at low and high flows, respectively. The fish ladder did not meet the OAR requirements for jump height and weir notch depth. Red text is used in these tables to highlight where the criteria were exceeded. The jump heights in the tables represent the difference between the water levels upstream and downstream of each weir compared with OAR requirements. At low flow conditions, only Weir 2 meets the jump height requirement. In the Project's fish ladder, the velocity at the weir crests meets the OAR velocity requirements for all the weirs at both low and high flow conditions. Under high flow conditions all of the weirs except 7, 10, 12, and 13 were submerged and fish could pass them by swimming, not jumping, as the flow depths and velocities available for swimming through the weir notches meet the OAR requirements. In

[12] Operators had opened the second orifice to compensate for stick debris partially blocking the first orifice.

summary, only Weir 2 met all of the OAR passage requirements at low flow, while all weirs but 7, 10, 12, and 13 met the requirements at high flow.

The minimum water depth over the fish ladder weirs required by the OAR is 12 inches when adult fish are present. The requirement when only juveniles are present is 6 inches. The juvenile requirement may be more applicable to this fish ladder because adult salmon are not present at the Project, and the salmonid species present are limited to rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*) that are closer in size to juvenile salmon. Based on a 6 inch minimum water depth all the fish ladder weirs would meet the OAR requirements during both the low and high flow conditions.

Overall the fish ladder appeared to be in good physical condition. However, the concrete in Weirs 14 and 15 showed signs of deterioration, and Weir 14 had shifted from the vertical axis.

Fish Screen

The flow in the diversion channel upstream of the fish screen is controlled by two gates: the diversion canal head gate and the backwater gate immediately downstream of the fish screen. Working in conjunction, these gates can maintain a constant water level at the fish screen regardless of the diverted flow in the canal downstream of the backwater gate. Hydraulic conditions at the fish screen were measured at diversion channel flows of approximately 51 cfs, 147 cfs, and 119 cfs, chronologically (see Table 19). The initial low and high flow measurement conditions are consistent with the diversion flows expected during 95% (50 cfs diverted) and 5% (150 cfs diverted) exceedance flows in the river of 444 cfs and 60 cfs, respectively. Post-maintenance measurements were conducted at the highest obtainable diverted flows at the time.

During low flow conditions, the average sweeping velocity past the screen was 1.06 ft/s. At the pre-maintenance high flow condition the average sweeping velocity was 3.16 ft/s. The average sweeping velocity recorded during the post-maintenance, high-flow evaluation was 2.35 ft/s. The respective increases in average sweeping velocity are proportional to the increases in canal flow during the evaluations. The pre- and post-maintenance sweeping velocities were approximately three and two and a quarter times greater than the low flow sweeping velocity. The measured sweeping velocities ranged from 0.0 ft/s to 2.0 ft/s during the low flow condition, 0.7 ft/s to 4.9 ft/s during the pre-maintenance high flow condition, and 0.84 ft/s to 3.35 ft/s during the post-maintenance high flow condition. Eddies were visible along the right wall downstream of the start of the fish screen and near the left wall closer to the bypass entrance. Sweeping velocity measurements are summarized below in Tables 22 through 24.

Table 20. Summary of fish ladder measurements at low flow and OAR requirements

Pool/ Weir No.	Estimated Flow (cfs)	Jump Heights		Notch Velocities		Weir Notch Depth (Not Applicable at Jumps)		Pool Depths		Energy Dissipation		
		Jump Height (inches)	Meets OAR Requirement (≤6 inches)	Velocity (ft/s)	Meets OAR Requirement (≤ 8 ft/s)	Measured Depth (inches)	Meets OAR Requirement (≥12 inches)	Average Measured Depth (ft)	Meets OAR Requirement (≥2ft)	Pool Volume (cubic ft)	Energy Dissipation (EDF)	Meets OAR Requirement (EDF >=4)
1	15.00	19.2	NO	7.1	YES	16.8	YES	2.2	YES	195	1.66	YES
2	15.00	4.8	YES	5.6	YES	10.8	NO	4.0	YES	380	2.78	YES
3	15.00	15.6	NO	5.6	YES	10.8	NO	5.8	YES	551	2.21	YES
4	15.00	18	NO	5.3	YES	11.4	NO	6.0	YES	570	1.99	YES
5	15.00	16.8	NO	5.6	YES	10.8	NO	9.0	YES	900	1.35	YES
6	15.00	18	NO	5.3	YES	11.4	NO	6.6	YES	660	0.18	YES
7	2.20	12	NO	2.4	YES	7.2	NO	2.9	YES	254	0.57	YES
8	2.20	14.4	NO	2.3	YES	7.8	NO	3.5	YES	307	0.47	YES
9	2.20	14.4	NO	2.8	YES	6.4	NO	4.4	YES	522	0.30	YES
10	2.20	15.6	NO	2.3	YES	7.7	NO	2.7	YES	258	0.52	YES
11	2.20	13.2	NO	2.4	YES	7.2	NO	2.9	YES	290	0.63	YES
12	2.20	18	NO	2.5	YES	7.1	NO	3.6	YES	490	0.32	YES
13	2.20	15.6	NO	2.4	YES	7.4	NO	4.2	YES	568	0.19	YES
14	2.20	10.8	NO	2.6	YES	6.7	NO	4.9	YES	285	0.43	YES
15	2.20	12	NO	2.5	YES	7.1	NO	5.2	YES	565	1.66	YES

Table 21. Summary of fish ladder measurements at high flow and OAR requirements.

Pool/ Weir No.	Estimated Flow (cfs)	Jump Heights		Notch Velocities		Weir Notch Depth (Not Applicable at Jumps)		Pool Depths		Energy Dissipation		
		Jump Height (inches)	Meets OAR Requirement (≤6 inches)	Velocity (ft/s)	Meets OAR Requirement (≤ 8 ft/s)	Measured Depth (inches)	Meets OAR Requirement (≥12 inches)	Average Measured Depth (ft)	Meets OAR Requirement (≥2ft)	Pool Volume (cubic ft)	Energy Dissipation (EDF)	Meets OAR Requirement (EDF >=4)
1	21.30	4.5	YES	4.3	YES	39.6	YES	3.8	YES	349	1.41	YES
2	21.30	1.5	YES	3.0	YES	27.6	YES	4.8	YES	469	0.35	YES
3	21.30	3.5	YES	5.1	YES	16.8	YES	5.7	YES	572	0.67	YES
4	21.30	SUBMERGED	NA[13]	6.5	YES	13.2	YES	5.6	YES	551	2.87	YES
5	21.30	SUBMERGED	NA[8]	6.5	YES	13.2	YES	5.2	YES	540	3.24	YES
6	21.30	SUBMERGED	NA[8]	5.9	YES	14.4	YES	6.3	YES	651	2.85	YES
7	8.00	19.5	NO	6.7	YES	9.6	NO	3.7	YES	337	2.41	YES
8	8.00	SUBMERGED	NA[8]	4.8	YES	13.2	YES	4.3	YES	395	1.32	YES
9	8.00	SUBMERGED	NA[8]	4.8	YES	13.2	YES	4.8	YES	616	1.01	YES
10	8.00	18.5	NO	4.4	YES	14.4	YES	3.5	YES	378	2.04	YES
11	8.00	SUBMERGED	NA[8]	4.8	YES	13.2	YES	4.2	YES	445	1.21	YES
12	8.00	17	NO	4.7	YES	13.5	YES	5.1	YES	703	1.01	YES
13	8.00	18	NO	4.8	YES	13.2	YES	5.5	YES	746	1.00	YES
14	8.00	SUBMERGED	NA[8]	4.9	YES	13.2	YES	5.9	YES	359	1.10	YES
15	8.00	SUBMERGED	NA[8]	4.8	YES	13.2	YES	5.5	YES	306	2.04	YES

[13] Weir submerged; notch velocity and flow depth apply for swimming passage.

Table 22. Pre-maintenance sweeping velocity (fps) at low flow diversion of 51 cfs

Transect No.	Location on Transect				
	Left	Mid-Left	Mid-Channel	Mid-Right	Right
1	1.13	1.66	1.18	0.88	0.55
2	1.75	1.59	1.44	0.93	0.09
3	1.77	1.76	1.39	0.28	0.54
4	1.86	1.89	1.74	0.01	0.14
5		2.00	1.80	0.98	
6		0.00	0.06	0.03	
7		1.24		1.04	

Table 23. Pre-maintenance sweeping velocity measurements (fps) at high flow diversion of 147 cfs

Transect No.	Location on Transect				
	Left	Mid-Left	Mid-Channel	Mid-Right	Right
1	2.22	1.95	2.53	0.99	1.67
2	3.02	4.13	3.32	2.43	2.21
3	3.35	4.40	3.93	3.43	2.23
4	3.34	4.87	4.19	3.66	3.61
5		4.28	4.63	3.66	
6		3.14	2.44	0.64	
7		3.54		1.84	

Table 24. Post-maintenance sweeping velocity (fps) at high flow diversion of 119 cfs

Transect No.	Location on Transect				
	Left	Mid-Left	Mid-Channel	Mid-Right	Right
1	2.20	2.44	2.26	1.89	1.02
2	3.02	2.79	2.44	1.67	1.38
3	3.31	3.26	2.87	2.11	0.84
4	3.04	2.89	2.69	1.87	0.84
5		3.19	2.72	1.87	
6		2.92	2.66	1.49	
7		3.35		2.89	

The average screen approach velocity was calculated for both low and high flow conditions using the flow passing through the fish screen and the effective screen area. During low flow conditions the average approach velocity is estimated to be 0.26 ft/s, which is below the 0.80 ± 10% criterion (ODFW, 1994; Taylor, S, 1995; PacifiCorp, 1999; NMFS, 1995; & NMFS, 2011). At pre-maintenance high flows, the average approach velocity is estimated to be 0.78 ft/s. Approach velocities were also directly measured along seven transects to quantify the flow distribution through the screens. During pre-maintenance high flow measurements approach velocities varied by 62% from the measured average of 0.71 ft/s, and higher velocities were

observed near the downstream end of the screen, where the approach velocity criterion was exceeded. Following installation of the redesigned baffles, the variation in approach velocities has been reduced to 34%. The location of high approach velocities has also shifted from the downstream end in shallow water to the upstream end in deeper water, where fish are less likely to encounter the screen. Approach velocity measurements are summarized below in Tables 25 through 27 with values more than ten percent above the average approach velocity indicated in bold font.

Table 25. Pre-maintenance approach velocity (fps) at low flow diversion of 51 cfs

Transect No.	Location on Transect				
	Left	Mid-Left	Mid-Channel	Mid-Right	Right
1	0.08	0.07	0.06	0.09	0.04
2	0.12	0.02	0.12	0.04	0.00
3	0.04	0.06	0.07	0.01	0.05
4	0.03	0.07	0.04	0.00	0.02
5		0.08	0.08	0.01	
6		0.00	0.06	0.02	
7		0.06		0.06	

Table 26. Pre-maintenance approach velocity (fps) at high flow diversion of 147 cfs

Transect No.	Location on Transect				
	Left	Mid-Left	Mid-Channel	Mid-Right	Right
1	0.24	0.60	0.39	0.37	0.09
2	0.62	0.51	0.17	0.13	0.22
3	0.60	0.71	**0.79**	0.45	0.42
4	0.68	0.74	**0.88**	0.42	0.53
5		**1.54**	**1.51**	**1.36**	
6		**0.82**	**1.11**	**1.43**	
7		**1.43**		**1.15**	

Table 27. Post-maintenance approach velocity (fps) at high flow diversion of 119 cfs

Transect No.	Location on Transect				
	Left	Mid-Left	Mid-Channel	Mid-Right	Right
1	**1.36**	0.62	**1.01**	**1.00**	0.49
2	**0.85**	**0.86**	0.46	0.49	0.27
3	**0.91**	**0.94**	**1.00**	**0.93**	**0.93**
4	0.78	0.76	0.44	0.49	0.62
5		0.68	0.49	0.48	
6		0.70	0.45	0.58	
7		0.72		0.72	

During low flow conditions, the average measured sweeping velocity (1.06 ft/s) and the calculated average approach velocity (0.27 ft/s) results in a ratio of 3.92. Table 28 presents this ratio for the measured pre-maintenance high flow conditions, where ratios varied by 77% from the average, and fell below 1.0 in one location at the end of the screen with a ratio of 0.45. Table 29 presents this ratio for the measured post-maintenance high flow conditions, where ratios varied by 36% from the average, and fell below 1.0 in one location, with a ratio of 0.91. The single point which did not meet the criteria shifted from shallow to deeper water, where fish are less likely to encounter the screen.

Table 28. Pre-maintenance ratio of sweeping to approach velocity (fps) at high flow diversion of 147 cfs

Transect No.	Location on Transect				
	Left	Mid-Left	Mid-Channel	Mid-Right	Right
1	9.25	3.25	6.49	2.68	18.56
2	4.87	8.10	19.53	18.69	10.05
3	5.58	6.20	4.97	7.62	5.31
4	4.91	6.58	4.76	8.71	6.81
5		2.78	3.07	2.69	
6		3.83	2.20	0.45	
7		2.48		1.60	

Table 29. Post-maintenance ratio of sweeping to approach velocity (fps) at high flow diversion of 119 cfs

Transect No.	Location on Transect				
	Left	Mid-Left	Mid-Channel	Mid-Right	Right
1	1.61	3.96	2.23	1.89	2.10
2	3.57	3.25	5.36	3.39	5.07
3	3.65	3.45	2.87	2.26	0.91
4	3.89	3.83	6.15	3.81	1.37
5		4.69	5.53	3.86	
6		4.19	5.86	2.55	
7		4.64		4.00	

Structurally the fish screen appears to be in good condition. The adjacent concrete is not deteriorated. During June 2015 maintenance activities, the screens were cleaned and removed, new baffles were installed, and the rubber seals were inspected and replaced as necessary. Inspection and maintenance of the facility is conducted pursuant to the intervals defined in the approved Fish Passage Facility Operations and Maintenance Plan.

Biological Evaluation

Fish Ladder

Thirty-five naturally-produced rainbow trout were captured, tagged with passive integrated transponder (PIT) tags, and released into Pool 1 of the fish ladder during the second week in June 2015 to determine upstream passage success rate and travel time. All test fish were greater than or equal to 65 mm in fork length. Fish tag and release dates included: June 11, 2015 (30 fish originating downstream of the fish ladder), June 12, 2015 (1 fish originating upstream of the fish ladder), and June 13, 2015 (4 fish originating upstream of the fish ladder). On June 11, 2015, the 30 fish originating downstream of the fish ladder were released into Pool 1 in groups of 10 in accordance with the Study Plan. The smallest fish was 89 mm fork length, and the largest was 215 mm fork length. Most fish ranged between 100 and 149 mm fork length (Table 30).

Table 30. Upstream fish passage test fish by size class

Size Class (Fork Length)	Number Tagged
65-99 mm	3
100-149 mm	23
150-199 mm	7
>200 mm	2

The tracking system consisted of four PIT-tag antennas, each with continuous detection and recording capabilities, to monitor passage of PIT-tagged trout introduced into Pool 1 of the fish ladder. The antennas were installed at the fish ladder entrance (Pool 1, Antenna A1), at each corner of the 90 degree turn (Pool 6, Antenna A2, and Pool 8, Antenna A3), and at the fish ladder exit (Pool 15, Antenna A4).

Successful upstream passage detections are summarized below in Table 31. Due to distinct behavioral differences, upstream-origin (rainbow trout captured upstream of the diversion dam) and downstream-origin (rainbow trout captured downstream of the diversion dam) test fish results are summarized separately. Fish captured upstream may have a naturally higher tendency to ascend the ladder than fish from downstream. For these reasons, it is likely that passage rate does not directly inform how effective the fish ladder is at facilitating upstream migration. Results also show that travel time to successfully ascend the ladder (once actively migrating upstream) ranges from a few hours to approximately one day (median = 16 hours). Overall, results show that relatively small fish (as small as 110 mm fork length during this study) can successfully ascend the fish ladder in less than 24 hours.

Table 31. Summary of successful upstream passage detections

Tag	Fork Length (mm)	Capture Origin	Capture Method	Release Date	Last at A1	Last at A2	Last at A3	First at A4	Travel Time
429	207	upstream	angle	6/11	6/12	6/12	6/12	6/12	12:04:59
429	207	upstream	angle	6/11	ND[a]	7/7	7/7	7/7	5:03:12
579	157	upstream	angle	6/11	ND[a]	6/12	6/12	6/12	24:40:52
443	122	upstream	angle	6/11	6/15	6/15	6/16	6/16	21:41:19

Tag	Fork Length (mm)	Capture Origin	Capture Method	Release Date	Last at A1	Last at A2	Last at A3	First at A4	Travel Time
528	110	upstream	angle	6/11	6/28	6/29	6/29	6/29	20:06:48
449	144	downstream	angle	6/11	6/13	6/13	6/13	6/13	4:52:22
544	126	downstream	e-fish	6/11	6/15	6/15	6/15	6/15	6:49:51
486	110	downstream	e-fish	6/11	7/14[b]	7/17	7/17	7/18	87:30:39

Upstream-origin Fish. Four of the five (80 percent) upstream-origin test fish successfully ascended the fish ladder. Upstream travel time (time from the last detection at Antenna A1 to detection at Antenna A4) ranged from 12 to 25 hours.

The fish with Tag 429 (207 mm fork length) successfully ascended the ladder twice. This fish first successfully ascended the fish ladder shortly after being released into Pool 1 during the second week in June, with no further detections. This first passage event took approximately twelve hours. Subsequently in July, this fish was detected at Antenna A2 (where the fish screen bypass return pipe enters the fish ladder). After being detected at Antenna A2, this fish successfully ascended the fish ladder again in approximately five hours.

Downstream-origin Fish. Three of the 30 (10 percent) downstream-origin test fish successfully ascended the fish ladder. Two fish successfully ascended the fish ladder in less than seven hours, but one fish took approximately 88 hours.

The fish with Tag 486 (110 mm fork length) successfully ascended the fish ladder over a protracted period. Detection history suggests this fish exited the ladder entrance shortly after release on June 11, then re-entered the fish ladder on July 13. After re-entering the fish ladder, this fish successfully ascended the ladder in approximately 88 hours.

Of note is that the largest fish tagged during this study (Tag 408, 215 mm fork length) did not ascend the fish ladder. This fish was detected sporadically for a few days in the vicinity of Antenna A1 after release and was never detected again. It was originally captured in the plunge pool at the base of the diversion dam via angling, and it is possible that this fish returned to the dam plunge pool after release in Pool 1 of the fish ladder.

Six of the 30 (20 percent) downstream-origin test fish were never detected, meaning they either stayed in the fish ladder between antennas A1 and A2 or exited the fish ladder entrance. Due to the relatively large number of PIT-tagged fish distributed in the fish ladder during the study period (35 fish from the upstream migration test and 30 fish from the downstream travel time test), tag collision likely resulted in a lack of detection for some individual antenna passage events.

Fish Screen

Safety and Effectiveness. The downstream fish passage safety and effectiveness test was conducted on July 1, 2015 to determine (1) downstream passage effectiveness for hatchery trout released into the bypass canal upstream of the fish screen and (2) injury of hatchery trout

successfully screened into the fish bypass system. All fish were rainbow trout or steelhead obtained from ODFW's Cole Rivers Hatchery in Trail, Oregon.

The first release was at 10:20 am using 150 fish ranging from 70 to 99 mm fork length. The second release occurred at 11:30 am using 150 fish ranging from 100 to 160 mm fork length. After a 4-hour test period, 22 hatchery fish were re-captured in the bypass fish collection device (Table 32). No apparent injury was noted on recaptured fish and all were alive. The bypass canal was then de-watered and fish were salvaged from the canal upstream of the fish screen via electrofishing. All fish salvaged from the canal upstream of the fish screen were alive and in good condition. No fish were found impinged on the fish screen and no potential surface irregularities that could cause injury or any gaps that could result in fish entrainment were observed.

Table 32. Summary of downstream fish passage safety and effectiveness evaluation

Size Class	Number Released	Number Caught in Bypass Trap (A)	Number Salvaged Upstream of Screen	Total Recaptured	Total Uncaptured (B)	Effectiveness (A/(A+B))
70-99 mm	150	13	129	142	8	61.9%
100-160 mm	150	9	111	120	30	23.1%

Hatchery fish held in the canal or moved upstream after release and did not exhibit an inclination to migrate downstream in a timely fashion. The canal composition and dimensions are similar to the hatchery raceways in which these fish were raised, and hatchery fish may have been conditioned to remain in such an environment.

During the canal salvage, fish were distributed from the head gate at the upstream end of the canal to the fish screen at the downstream end. Based on visual observation of fish swimming in the canal upstream of the screen and upstream of the headgate in the impoundment after release, it is likely that some of the fish not captured during the test migrated upstream and out of the canal. Fish exiting the canal upstream would result in an overestimate of fish assumed to be entrained and an underestimate of effectiveness. The effectiveness value calculated for the larger test fish size class (100 to 160 mm fork length) is low (23 percent). This low value can occur as a product of either a high entrainment rate, a high rate of fish swimming upstream and out of the canal, or a combination of both. Larger fish likely have an inherently lower potential for entrainment and conversely, smaller fish have an inherently higher potential for entrainment. However, the smaller test fish size class (80 to 99 mm fork length) had an effectiveness value more than double that of the larger size class, indicating a much lower potential entrainment rate. If entrainment of the larger fish size class was actually high, a high rate of entrainment of the smaller fish size class would also be expected. Furthermore, after canal dewatering and screen inspection, we observed no gaps that could result in fish entrainment. Overall, these data and observations suggest that the cause for the low effectiveness value of the larger fish size class is likely due to upstream migration out of the canal and not from a high level of entrainment. Based on the distribution of fish from all size classes throughout the canal during the fish

salvage, it is also likely that fish from the smaller size class also migrated upstream out of the canal resulting in an under estimate of effectiveness and an overestimate of entrainment.

Downstream Passage Time. Travel time through the fish bypass system (time from introduction into the bypass pipe to exiting the downstream end of the fish ladder) was measured with PIT-tagged hatchery trout released on July 1, 2015. Hatchery test fish ranged from 80 to 123 mm fork length. Size class distribution of test fish is summarized in Table 33.

Table 33. Downstream passage time evaluation fish by size class

Size Class (Fork Length)	Number Tagged
80-99 mm	10
100-123 mm	20

Of the 30 PIT-tagged hatchery rainbow trout released at the entrance to the fish screen bypass pipe, three fish were never detected at an antenna (10 percent); five fish (17 percent) apparently remained in the fish ladder during the study period; and 22 fish (73 percent) were determined to have exited the downstream end of the fish ladder, with a median travel time of approximately 195 hours. Of the 22 fish that exited the downstream end of the fish ladder, one fish migrated back upstream all the way through the fish ladder to Antenna A4 (a successful upstream passage event). Travel time statistics of the 22 fish determined to have exited the downstream end of the fish ladder are summarized in Table 34.

Table 34. Downstream passage time summary statistics

Travel Time Statistic	Hours
Maximum	1108:24:22
Median	194:31:03
Minimum	8:05:51

Measurement of downstream travel time may be biased by using hatchery origin test fish, which were raised in a concrete raceway that is similar in nature to a concrete fish ladder pool. Hatchery trout downstream-migration behavior may not be representative of naturally-produced trout behavior.

In-stream Flows

Project operations in the no action alternative divert up to 150 cfs from the South Fork Rogue River at the Project diversion dam and affect the seasonal instream flow pattern in the South Fork Rogue River downstream of the dam. The reduction of "unimpaired flows"[14] in the

[14] Unimpaired flow is a standard hydrologic term, which in this case is the estimated flow regime that assumes no Project-related diversions at any time. However, it otherwise assumes the existence of the current channel configuration and runoff conditions. Therefore, the definition of unimpaired flow is distinct from (and may differ from) "natural" or "pre-project, historical" flows.

bypassed reach resulting from the diversion has the potential to impact native rainbow and cutthroat trout habitat, as well as other physical and biological processes, particularly in the upper 2.8 miles of the bypassed reach (RM 7.7 to RM 10.5), where water releases at the dam comprise 100 percent of instream baseflows. Although Project operations result in flow reductions throughout the 10.5-mile length of the bypassed reach, potential Project-related effects on habitat are considerably less below RM 7.7, due to flow augmentation from spring inflows, groundwater contributions, and tributaries, including the Middle Fork Rogue River.

The fish community in the South Fork bypassed reach is currently protected by a minimum flow of 10 cfs below the diversion dam per License Article 402 in the no action alternative. The minimum flow was established based on the results of an in-stream flow study, which developed relationships between flow and fish habitat (Campbell-Craven Environmental Consultants, 1986). The objective of the in-stream flow study was to identify a range of minimum flows that were capable of providing suitable habitat for rainbow trout fry, juveniles, and adults[15]. The study involved a substantial field component, including a hydrology study, a meso-habitat survey, and the collection of fine-scale micro-habitat data (i.e. velocities, depths, and substrate) at 12 transects over a range of flows between 5 cfs and 50 cfs. These field data were then used to calibrate a habitat model, called IFG4. The model was used to simulate rainbow trout habitat, computed as the composite of velocities, depths, and substrate between flows of 1 cfs and 150 cfs. Output from the IFG4 model provided estimates of "weighted usable area" (WUA), which is an index of habitat suitability, based on published habitat suitability criteria for rainbow trout. The habitat-flow relationships developed by the modeling, known colloquially as habitat curves generated the following conclusions:

- WUA for rainbow trout fry is highest between flows of 1 cfs and 3 cfs, and decreases precipitously at flows above 6 cfs.
- WUA for juvenile rainbow trout increases rapidly between flows of 1 cfs and 20 cfs, above which the WUA begins to decline.
- WUA for adult rainbow trout increases rapidly between flows of 1 cfs and 20 cfs, reaches a peak about 50 cfs, then gradually declines as flows increase.

An instream flow analysis was prepared pursuant to the current relicensing effort to assess expected changes in hydraulic conditions and fish habitat under various minimum flow scenarios in the bypassed reach of the South Fork Rogue River below the Project diversion dam. The analysis considers the effects of instream flow scenarios on the habitat of all life stages of cutthroat (*Oncorhynchus clarkii*) and rainbow trout (O. *mykiss*). The instream flow analysis was directed at the upper section of the bypass reach from river mile (RM) 10.5 (just below the dam) downstream to RM 7.0 (at the Butte Falls Highway Bridge). This upper section represents the portion of the bypass reach that is directly influenced by Project operations, prior to any downstream tributary input. This upper 3.5-mile section of the bypass reach consists of: (a) a 2.8-mile reach below the diversion dam where instream baseflows are comprised only of releases from the dam; and (b) a subsequent 0.70-mile reach where springs and groundwater inflows

[15] The spawning lifestage was omitted from the analysis, as the South Fork bypass does not appear to support spawning at any flow (Campbell-Craven Environmental Consultants, 1986).

contribute to the instream baseflows. This analysis did not extend below RM 7.0, because flow augmentation from additional sources, including major tributaries, appreciably lessens the Project's operational influence over instream flows.

During the development of the Study Plan for instream flow analysis, resource agencies requested that PacifiCorp measure baseflow augmentation between RM 7.7 and 7.0. PacifiCorp measured river flows in the lower portions of the study reach in mid-June and early-August 2014 and found that appreciable baseflow augmentation was occurring. PacifiCorp measured flows of approximately 38 and 41 cfs in mid-June and early-August of 2014, respectively, at RM 7.0 (the Butte Falls Highway Bridge). At the same time, flows at the USGS gage RM 10.25 (USGS gaging station 14332000) were recorded to be 12 cfs and 20 cfs, respectively. Comparison of the these measurements indicated that augmentations of approximately 26 cfs and 20 cfs were occurring in the bypassed reach between the two points in June and August, respectively. The current instream flow analysis assumes a conservative, reach-representative baseflow contribution of 16 cfs. This value was derived via a GIS-based area-weighted average calculation of baseflow contributions at mapped points of inflow.

The current analysis sought to: (1) model the hydraulic parameters (e.g. water surface elevation, velocity, wetted perimeter, etc.) of the bypassed reach under varying instream flow scenarios; and (2) compute the fish habitat expected to occur as a result of these hydraulic conditions under the various scenarios. The hydraulic and habitat simulations for this analysis were performed using the physical data collected from the 1986 IFIM study and refined by the 2014 fish habitat stream inventory conducted by Siskiyou Research Group. The instream flow models used for this analysis produce outputs and results that are assumed to remain applicable over time in a stream reach that is in a state of dynamic equilibrium.

The results of the analysis indicate that there is a lack of suitable trout spawning habitat, and this may be an important limiting factor to native trout in the bypassed reach. Spawning habitat limitations were also discussed as a likely limiting factor in the 1986 study report (Campbell-Craven Environmental Consultants 1986a). Spawning habitat in the bypassed reach may only be available in small patches in and around boulders, behind fallen logs, and other areas that allow gravel to accumulate. Although the transects used in this analysis are representative of the bypass reach, spawning area composed of small gravel patches (i.e., "pocket spawning") may not be adequately captured by the model.

Habitat-Flow Relationships

PacifiCorp used the System for Environmental Flow Analysis (SEFA; Jowett et al., 2014) model to develop hydraulic models that predict velocity and depth across study transects placed in various habitat types in the bypassed reach. The output of the hydraulic models was then used in conjunction with approved habitat suitability curves (HSC) to produce habitat-flow relationships for target rainbow trout and cutthroat trout life stages, including fry, juvenile, adult, and spawning. The "habitat" value computed by the SEFA model is a value of Average Weighted Suitability (AWS) in units of square-feet of habitat per lineal foot of channel (ft^2 per ft). The habitat-flow relationships for the life stages of cutthroat trout and rainbow trout are shown in

Figure 8 and Figure 9, respectively. To compare the relative abundance of the calculated habitat for each species' life stage to each other, the habitat-to-flow relationships are also "normalized" so that AWS values at each flow are in terms of the percent of the highest simulated AWS across all flows. The normalized curves are shown in Figure 10.

Determining the inflection point of the habitat/flow relationship is a common procedure for assessing minimum flow requirements using habitat methods (Jowett 1997). For this analysis, the inflection point is defined as the point on the habitat/flow curve where the curve's slope changes from being greater than to less than 1:1. In other words, the curve's rise goes from being greater than to less than the run.

Cutthroat Trout

Fry. Cutthroat trout fry habitat increases steeply as flows rise in the bypass to a peak habitat level that occurs at 6 cfs. At flows above 6 cfs, cutthroat trout fry habitat drops back down until 14 cfs after which the habitat essentially levels off, decreasing only gradually as flows increase. The habitat curve shape for cutthroat trout fry indicates a strong preference for low velocities, which occur mainly in habitat cells along the sides of the channel that are usually maximized at or below the inflection point of the wetted perimeter of the channel. Velocities tend to stay low along the stream margins even as flows rise. The shape of the fry habitat curve for the bypassed reach is similar to most habitat-flow curves for fry of most trout species in the western U.S, including rainbow trout.

Juvenile. Habitat for juvenile cutthroat trout increases steeply as flows rise to a peak habitat level at 32 cfs. The inflection point on the habitat-flow curve is at 20 cfs. At flows above 32 cfs, juvenile cutthroat trout habitat declines gradually as flow increases. The amount of computed habitat for juvenile cutthroat trout was relatively high across the range of simulated flows compared to the other species' life stages.

Adult. The adult cutthroat trout habitat-flow relationship is similar to the juvenile cutthroat trout relationship, except adult habitat does not increase quite as much as flows initially rise, and the peak occurs at a higher flow of 50 cfs. The inflection point on the habitat-flow curve is at 28 cfs. Habitat levels drop gradually at flows above 50 cfs.

Spawning and Egg Incubation. The total amount of spawning and egg incubation habitat for cutthroat trout is the lowest of all the life stages evaluated. There is little spawning habitat at lower flows, and cutthroat spawning habitat increases very gradually as flow increases. The HSC for spawning cutthroat show a relatively narrow preferred range of stream velocities from approximately 0.5 to 2.0 fps, which might partially explain why the calculated habitat quantities are low, but that is not likely the factor limiting spawning habitat. The limiting factor is most likely the high suitability assigned to gravel-only spawning substrates, with a very small level of spawning suitability assigned to cobble substrates. This limited substrate preference also limits the amount of habitat calculated. Gravel was only shown to exist at the edges of two transects. As flows increase, water levels rise, providing more of these edge cells with suitable depths and velocities, thereby increasing the habitat with increasing flows.

Figure 8. AWS curves for each life stage of cutthroat trout in the upper bypassed reach

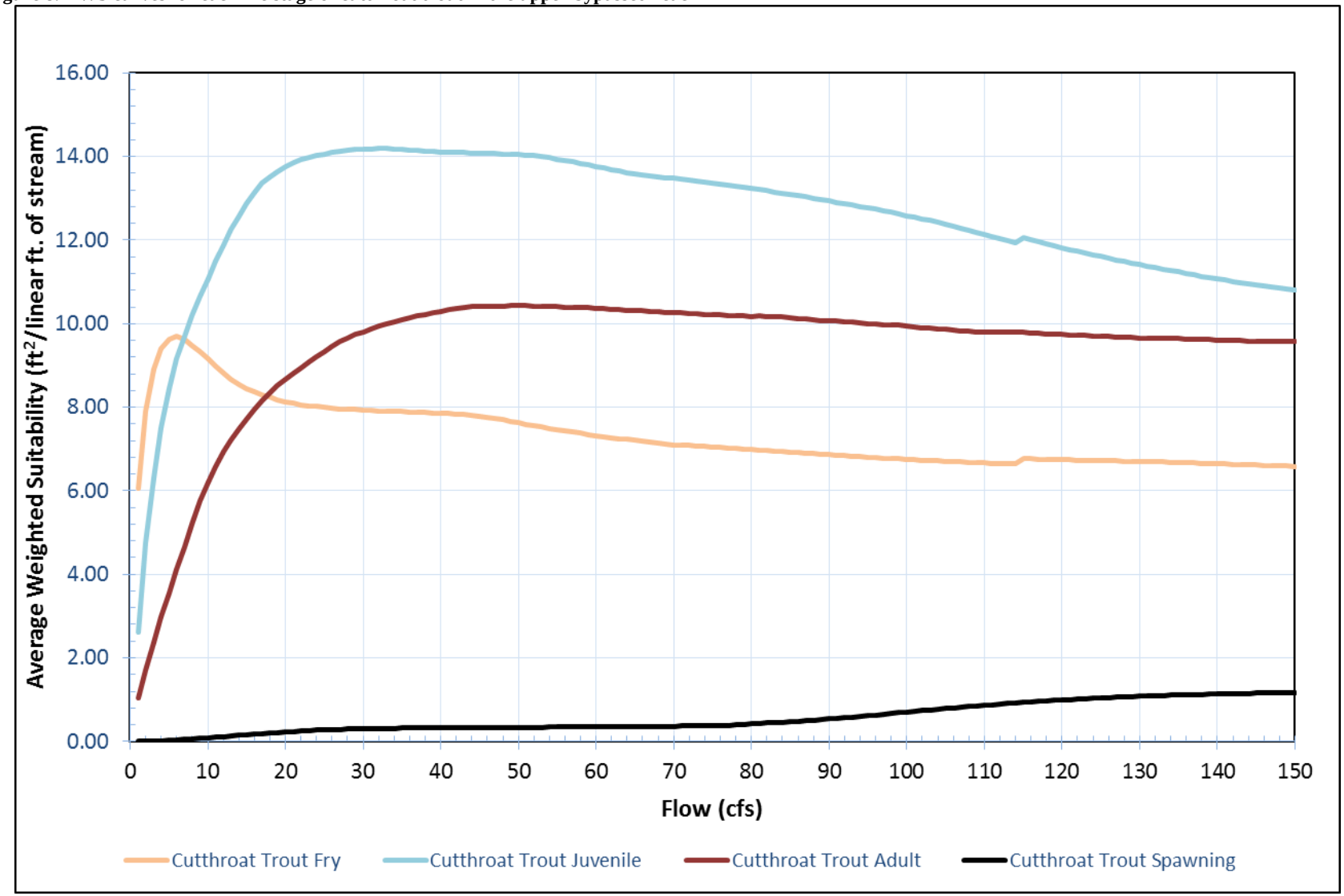


Figure 9. AWS for each life stage of rainbow trout in the upper bypassed reach

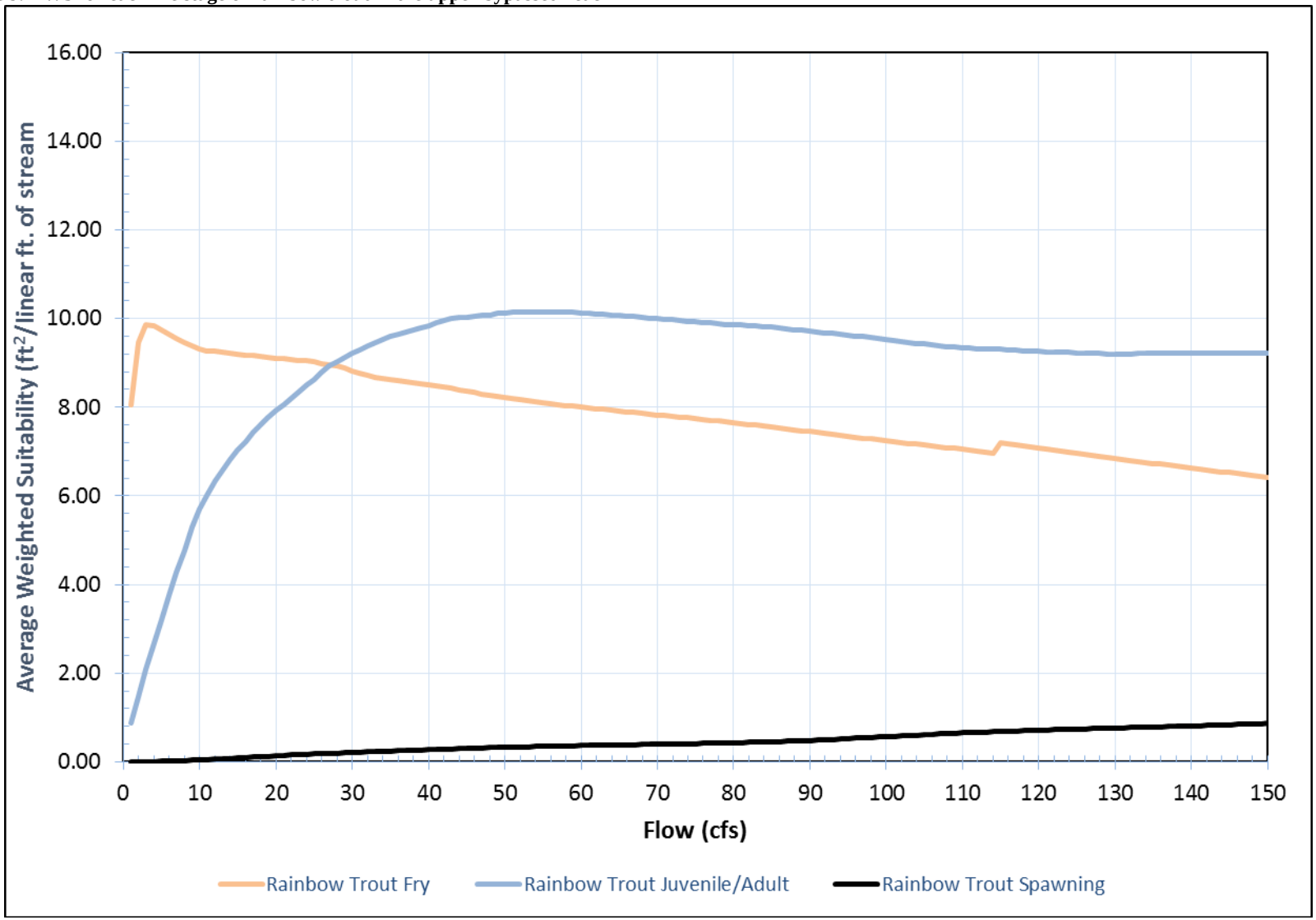
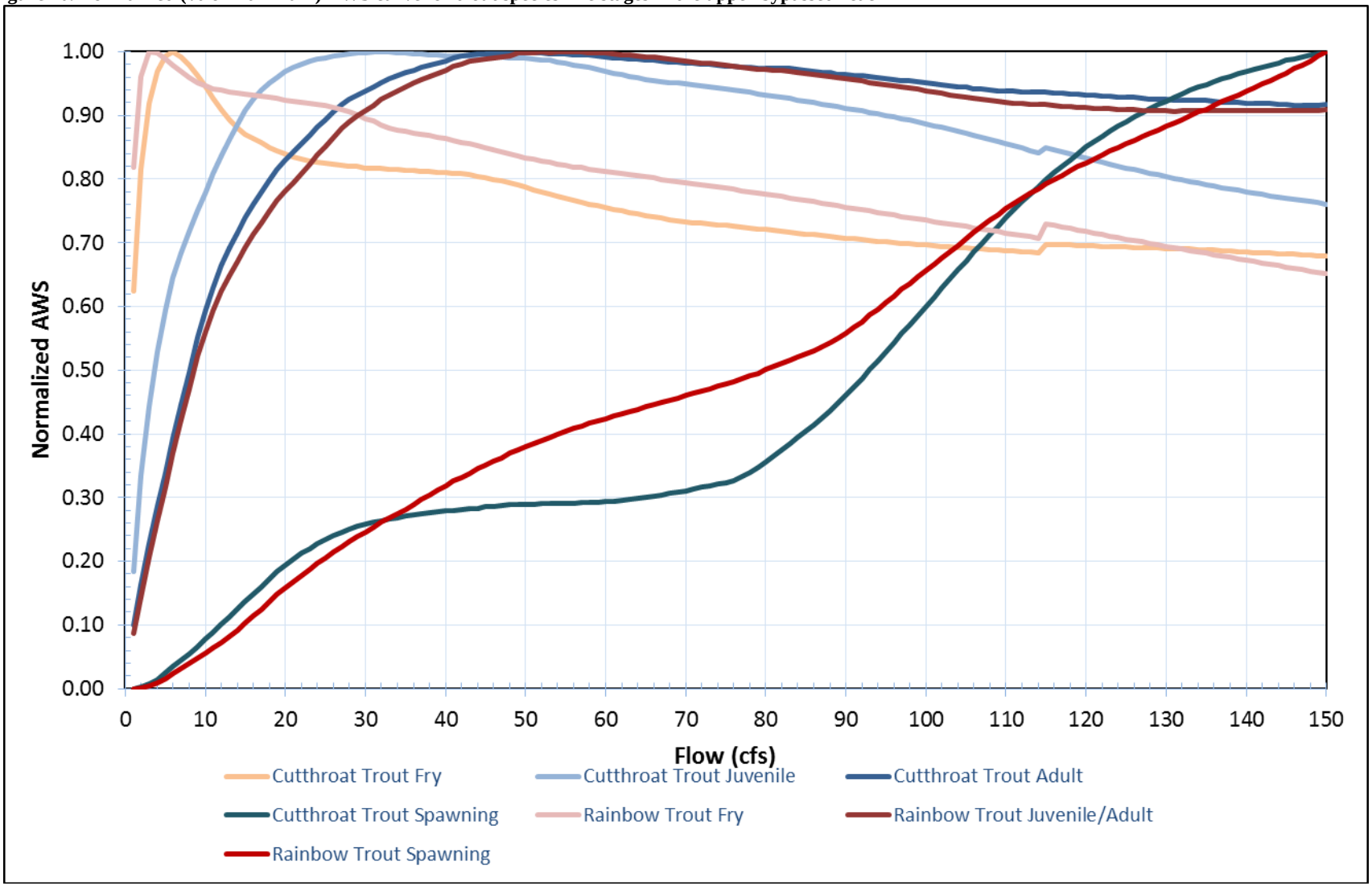


Figure 10. Normalized (% of maximum) AWS curve for trout species' life stages in the upper bypassed reach



Rainbow Trout

Fry. The habitat-flow relationship for rainbow trout fry is similar to that described above for cutthroat trout. The habitat rises steeply with increasing flow to a peak habitat level at 3 cfs and then decreases gradually as flows increase above 3 cfs. Rainbow trout exhibit a slightly wider range of depth preference than cutthroat trout. As flows increase, the resultant depths are slightly more suitable over a slightly greater area for rainbow trout fry than for cutthroat fry.

Juvenile and Adult. Rainbow trout juvenile and adult habitat suitability are combined in the habitat calculations because their HSC were the same. Habitat rises as flows initially increase to a peak at 50 cfs. The inflection point on the habitat-flow curve is at 30 cfs. The HSC for rainbow trout are almost identical to adult cutthroat trout, and therefore, their respective habitat-flow relationships are nearly identical.

Spawning and Egg Incubation. The habitat-flow relationship calculated for rainbow trout spawning and egg incubation is similar to that described above for cutthroat trout spawning and egg incubation. However, because the rainbow trout HSC for velocities is higher over a wider range of velocities, the amount of rainbow trout spawning habitat is slightly higher in the range of flows from 30 cfs to 90 cfs compared to cutthroat trout spawning habitat.

Habitat Duration Analysis

In addition to the habitat-flow relationships generated by SEFA modeling, a habitat duration analysis was performed to assess the percentage of time that habitat levels in the bypassed reach would be equaled or exceeded under alternative instream flow regimes. The habitat-flow relationships were used to evaluate habitat frequency and duration under a number of assumed flow regimes, including: (1) the unimpaired flow regime, also referred to as the no-diversion scenario; (2) the current baseline regime (i.e., no action alternative) of a minimum flow of 10 cfs; and (3) alternative flow regimes that assume minimum flow levels ranging from 15 cfs to 50 cfs. The results from the habitat duration analysis are useful to illustrate the potential effects on habitat of various flow alternatives compared to baseline conditions.

Habitat duration plots were developed to display the relationship between a value of AWS and the percentage of time that an AWS value is equaled or exceeded during the period (over the 20-year period-of-record). For each habitat duration plot, three metrics were calculated by integrating the area under the plots within the percentiles of 10 and 90 percent, 25 and 75 percent, and 45 and 55 percent. In addition, a fourth metric, the maximum total AWS, was determined. These four metrics provide objective index values of habitat duration that enable straightforward comparisons of total AWS levels between the various flow alternatives.

The habitat duration metrics computed for the minimum flow alternatives for each life stage show similar trends for both native trout species. For both cutthroat and rainbow trout fry, each of the four habitat duration metrics is highest at the 15-cfs minimum flow scenario. However, the differences in the metrics between the 15-cfs minimum flow scenario and other scenarios are not

substantial (e.g., the 10-to-90 percent metric for the 15-cfs minimum flow scenario is 8 to 20 percent higher than the other scenarios). The habitat duration metrics computed for juvenile and adult life stages are highest at the 30-cfs or 50-cfs minimum flow scenarios, respectively. However, the differences in the metrics between the 30-cfs or 50-cfs minimum flow scenarios and other scenarios are minor (e.g., the 10-to-90 percent metric for the 30-cfs or 50-cfs minimum flow scenarios is 1 to 28 percent higher than the other scenarios). For both cutthroat and rainbow trout spawning, the habitat duration metrics are substantially highest for the unimpaired flow scenario. Of the alternative minimum instream flow scenarios, the metrics are highest at the 50-cfs scenario. However, the differences in the metrics between the 50-cfs minimum flow scenario and other alternative scenarios are not substantial (e.g., the 10-to-90 percent metric for the 50-cfs minimum flow scenario is 5 to 20 percent higher than the other alternative scenarios).

Ramping

The Project is capable of increasing and decreasing flow volumes in the bypassed reach downstream of the diversion via operation of the diversion headgate intake. In general, the rate at which these flow volume changes occur is called the "ramp rate" or "ramping." From a fisheries perspective, a rapid decrease (i.e., "down-ramping") of river flow has the potential to strand fish in areas of the channel that are relatively low-gradient, or where pockets or side channels exist in the river channel. Smaller juvenile fish (less than about 50 mm long) are most vulnerable to potential stranding because of weak swimming ability and typical habitat preference. River channel configuration, channel substrate type, time of day, water temperature, and flow level before down-ramping (antecedent flow) are also key factors that determine stranding incidence.

The Project bypassed reach experiences regular, natural increases of river stage from rain-on-snow events due to its location in the transient snow zone. Rapid increases in river stage, whether natural or operational, have the potential to mobilize sediment above the previous water surface elevation, which may increase turbidity above state water quality criteria and potentially bury spawning redds in the bypassed reach.

The current Project license does not include restrictions on Project-induced flow fluctuations (i.e., ramping) in the bypassed reach. Under the no action alternative, Project ramping may result in impacts to fishery resources via standing in the South Fork Rogue bypassed reach. Generating unit trips do not result in ramping in South Fork Bypass. Canal intake headgate operation does not automatically respond to changes at the generating unit and flows continue to the Middle Fork Canal via the PRV. Any ramping in the South Fork bypassed reach coincident to unit trips is the result of natural increases in stage from precipitation and resulting storm flows upstream of the diversion dam and not from Project operations.

Prior to PRV and tailrace backwater gate automation, unit trips resulted in ramping in Daniel Creek and Middle Fork Rogue via the forebay overflow spillway, but this type of ramping has been eliminated by automation of the PRV and tailrace backwater gate in 2014 and 2016, respectively. The PRV also eliminates the need to dewater the Project waterway during generating unit maintenance, thereby generally precluding the need to refill the waterway and subsequently ramp the South Fork Bypass down when the unit is brought back online.

A total of eighteen operational ramping events (five planned outage up-ramps and thirteen return-to-service down-ramps) were observed in the bypassed reach during a four-year study period, resulting in an average of 4.5 operational ramping events per year (PacifiCorp, 2015). Eleven of the eighteen recorded operational ramping events (61 percent) did not exceed 0.2 feet per hour from May 1 through September 30 or 0.3 feet per hour from October 1 through April 30, ramp rates similar to those identified as protective of aquatic life, including sensitive life stages of native fish in the South Fork watershed (PacifiCorp, 2003). The majority of planned outages (55 percent) did not result in ramping in excess of these rates in the bypassed reach. When generation was resumed after an outage, ramping in excess of these rates was avoided on seventy percent of all occasions.

Project operations only influence ramping in the bypassed reach immediately before and after outages that require dewatering of the conveyance system. Under the no action alternative, waterway outages are regularly required for wood-stave pipeline repairs.

Woodstave Pipeline Failure

Woodstave pipeline failure may potentially result in sediment mobilization, flushing flows, and/or burial of redds in the South Fork and/or Middle Fork Rogue from the flowline or sag-pipe, respectively. The magnitude of an erosive event from woodstave pipeline failure is dependent on the location of the failure, distance and elevation of the failure from natural waters, and volume of diversion at the time of failure. Sediment mobilization from woodstave pipeline failure would have short-term adverse impacts on trout spawning habitat, but could potentially have positive, long-term impacts as fine sediments continue to be washed out in the bypassed reach and appropriate spawning gravels remain.

Flowline failure would result in a low forebay alarm and/or generating unit trip in the Project control system as diverted flows drop off rapidly due to leakage. The alarm would trigger a response from PacifiCorp's Hydro Control Center (HCC), which would contact on-site operators for immediate call-out. Total response time, and therefore duration of leakage, is estimated at one hour: approximately thirty minutes for reduced flows to reach the forebay following initiation of leakage and approximately thirty minutes for an operator to arrive on site and close the headgate to cease diversion and leakage.

A failure at the upstream end of the flowline exhibits reduced risk and potential severity of fishery impacts due to flowline proximity to both water surface elevation (vertical distance) and ordinary high water mark (horizontal distance) of the bypassed reach. Risk and potential severity increase with downstream distance as the flowline ascends the canyon and increases the vertical and horizontal distance from the bypassed reach, thereby increasing the volume of sediment exposed to leakage. The potential for flowline failure is primarily a function of rockfall and structural deterioration of the woodstaves. Rock slopes on the inboard side of the flowline have a history of rockfall that have caused major damage to the existing saddles and woodstaves. Preliminary geotechnical investigations revealed several large rock blocks in the slope that are being undermined and are losing their basal support, primarily in the upper half of the flowline

(Conforth Consultants, Inc., 2014). No signs of ancient landslide terrain or global instability were observed during the site reconnaissance of the flowline, and no historically active deep-seated slumps or rotational slides were observed.

Project sag-pipe failure would result in a water differential alarm at Sag-Pipe 3 of the Prospect Nos. 1, 2, and 4 Project, near Red Blanket Creek, when the total diversion in the Middle Fork Canal is less than the sum of the Middle Fork diversion and South Fork diversion. The differential alarm at Sag-Pipe 3 would trigger a response from PacifiCorp's Hydro Control Center (HCC), which would contact on-site operators for immediate call-out. Total response time, and therefore duration of leakage, is estimated at one hour: approximately thirty minutes for reduced flows from the Project sag-pipe to reach Sag-Pipe 3 following initiation of leakage and approximately thirty minutes for an operator to arrive on site and close the Project headgate to cease diversion and leakage to the Middle Fork Rogue.

Severity of sag-pipe failure impacts on fishery resources increases with horizontal distance away from the Middle Fork Rogue channel and exposure of increasing volumes of sediment to leakage. The sag-pipe is not exposed to the same rockfall hazards as the flowline, and the potential for sag-pipe failure is primarily a function of structural deterioration and exposure. Several shallow/surficial slope failures were observed on the southwest slope during geotechnical investigations (Conforth Consultants, Inc., 2014). These appear to be localized features in over-steepened sections of the slope, likely attributed to site grading during construction. A larger (approximately 30-foot wide) slump was observed roughly 30 feet west of the sag-pipe. This feature appears relatively shallow and is likely attributed to saturated ground conditions due to pipe leakage. On the northeast side of the valley, cuts were made to facilitate construction of the sag-pipe. Locally, these cuts are over-steepened; however, no signs of slope failure or excessive erosion were observed. There is noticeably less deterioration and leakage on the northeast side of the river. Pipe footings on both sides of the river exhibit little to no displacement.

Whitewater Boating Flows

Scheduled reductions in Project diversion with the intent of increasing flows in the bypassed reach of the South Fork Rogue for improved whitewater boating opportunities are not included in the no action or proposed Project alternatives (see analysis of recreation resources in Section E.6.8). Therefore, analysis of whitewater boating flows on fishery resources in the South Fork Rogue is not provided herein.

E.6.3.3 Proposed Environmental Measures

PacifiCorp proposes to implement minimum in-stream flows of 30 cfs from March 1 through July 31 and 20 cfs from August 1 through February 28 within the bypassed reach of the South Fork Rogue River below the South Fork Diversion Dam as measured at the USGS gage at RM 10.25. One method of evaluating normalized habitat graphs (see Figure 10) is to follow the lowest combined curve of the collective curves to see where the peak of the lowest combined

curve occurs (i.e., where does the lowest ascending curve first cross a descending curve). The premise behind this method is that the peak of the combined lowest normalized line is at a flow that provides the maximum amount of habitat for the species' life stages being considered as a group. In Figure 10, the "bottom-line" peak, excluding spawning curves, occurs at 24 cfs, at which point, the maximum amount of habitat (approximately 82 percent of maximum AWS) for the combination of remaining curves would be achieved. More specifically, additional gains in juvenile/adult rainbow trout AWS are at the expense of cutthroat trout fry habitat. All other flows along the curve provide lesser AWS levels for at least one life stage in the group, with the exception of spawning, which increases to the limits of the model at 150 cfs. Inclusion of the spawning curves in the "bottom-line" analysis yields a peak of approximately 70 percent of maximum AWS at approximately 108 cfs. In the no action alternative, spawning rainbow trout have approximately 5 percent of maximum AWS; the proposed Project minimum in-stream flow of 30 cfs from March 1 through July 31 yields approximately 25 percent of maximum AWS, a 500 percent increase from the no action alternative. Additionally, the mean of the inflection points for cutthroat juveniles (20 cfs), cutthroat adults (28 cfs), and rainbow adults and juveniles (30 cfs) is 26 cfs. Finally, the hydraulic simulations of WSE prediction and velocities illustrated water surfaces rising relatively steeply as flows increase up to approximately 25 cfs and leveling off at higher flows. These modelled results justify scientifically-balanced selection of 30 cfs from March 1 through July 31 and 20 cfs from August 1 through February 28 for protection of fishery resources below the diversion dam.

In their comments on the draft license application (DLA), ODFW proposed a minimum flow of 20 cfs from November 1 through February 28 and 30 cfs from March 1 through October 31 for "enhancement and protection of native trout in the South Fork Rogue River" (Oregon Department of Fish and Wildlife, 2016). ODFW noted that "split minimum flows based on life history needs provide additional protection and habitat." PacifiCorp considered this proposal, elected to incorporate seasonal minimum flows, but modified the proposed seasonality. PacifiCorp's proposal to provide 30 cfs from March 1 through July 31 more accurately reflects the natural attenuation of inflows to the Project (see Table 5 and Table 6). Mean average inflows to the Project drop from 270 cfs in June to 132 cfs in July and 92 cfs in August. The lowest inflows to the Project typically occur in October at a mean average inflow of 74 cfs. Rainbow trout spawning and incubation has typically ceased by the end of July (PacifiCorp, 2003), and reducing flows to 20 cfs in August would strike a balance between maximizing AWS for spawning and minimizing the loss of AWS for fry life stage periodicity (see Figure 10), which has been observed from April through September for cutthroat trout and May through October for rainbow trout (PacifiCorp, 2003). Retaining a 30 cfs minimum in-stream flow through July optimizes the hydraulics through the fish ladder during the observed period of peak up-stream migrations.

Increasing the minimum in-stream flow, from the no action alternative of 10 cfs to 30 cfs from March 1 through July 31 and 20 cfs from August 1 through February 28 cfs in the proposed Project, results in a seasonal loss of 10 to 20 cfs of potential Project generation flow. This loss of Project generation amounts to 4,864 MWh per year and, at current power prices, a loss of $211,146 per year in Project revenue. Loss of Project diversions results in a corresponding (approximately 95 percent) loss of generation and revenue at the Prospect Nos. 1, 2, and 4

Hydroelectric Project through conveyance of Project waters to the Middle Fork Canal via the sag-pipe. Therefore, the total loss of revenue resulting from 10 and 20 cfs seasonal increases in minimum in-stream flow is approximately $411,744 per year at current power prices.

PacifiCorp modelled and measured flows below the dam and fish ladder exit during stream-mode (i.e., no flow over the dam spillway) in November 2016 and determined that the existing configuration for supplying minimum flows to the bypassed reach is not sufficient to reliably pass the maximum proposed seasonal minimum flow of 30 cfs. PacifiCorp contracted engineering support from Alden Research Laboratories (Alden) to produce a conceptual design for an auxiliary bypass flow system to achieve 30 cfs in the bypassed reach. The resulting conceptual design proposes to withdraw auxiliary water from the impoundment via one of the existing fish ladder exit orifices (Olken, Auxiliary flow and fish ladder modifications to address ODFW comments for Prospect 3, 2016).

Operating the fish ladder with a single exit orifice would reduce the fishway flows by less than 10 percent during low flow conditions and lower the water depth over the fishway weirs by approximately one inch or less. Operating the fishway with one exit orifice is consistent with historic fishway operations. The existing orifice gate, operated as a sluice gate supply for the auxiliary flow system, would allow PacifiCorp to fine tune the flow in the auxiliary flow system from 0 cfs to 30 cfs, as needed depending on the instream flow requirements and flows in the fish ladder and fish bypass return pipe at the time.

No changes are needed to the existing orifice gates as part of the auxiliary bypass retrofit. A trash rack would be added upstream of both orifices to prevent large debris from entering the fishway or auxiliary flow system. This trash rack would slope back towards the dam work deck to aid in manual cleanings. A guide wall between the fishway exit and auxiliary flow entrance would also be added to the reservoir to prevent fallback of fish exiting the fishway.

A concrete isolation wall would be constructed between the two exit orifices in the fish ladder downstream of the dam. This wall would stretch from the dam to a point immediately below Weir 13, thereby reducing the width of Pools 13, 14 and 15 by approximately 2.5 feet. Alden's one-dimensional model indicates that these pools would still meet ODFW energy dissipation criteria. The weir notches of Weirs 14 and 15 would be shifted 1.5 feet to the northeast to accommodate the isolation wall. The modifications would include repair to existing damage (spalling concrete and a weir shifted from the vertical-axis) noted at Weirs 14 and 15. The weir width and crest elevations would remain the same. A 1.5 foot-wide portion of the walls of Weirs 14 and 15, on the auxiliary flow side of the isolation wall would be removed to create a 1.5-foot-wide auxiliary flow channel. A small portion of Weir 13 would also be removed. This channel would follow the bottom slope of the fish ladder for approximately 15.4 feet, until a point immediately downstream of the lower fishway deflector wall. From here the auxiliary flow trough would turn south through a slot cut into the side of the existing river-side, upper fishway wall. This turn would have a 5:1 ratio of bend radius to pipe diameter (R/D radius). After passing through the wall the trough would transition into a 19.5 foot- long modular metal trough. This trough would drop approximately 0.13 feet to an elevation of 3367.5 feet. A short horizontal trough section at the discharge would create a horizontal flow exiting the trough.

The auxiliary flow discharge location is 9.0 feet above the existing low tailwater level. The actual tailwater level for the proposed Project may be higher as a result of increased minimum flows in the bypassed reach. At the existing low tailwater level, the impact velocity would be 25.0 feet per second (fps) or less for auxiliary flows between 5 cfs and 20 cfs. At flows up to 30 cfs, the maximum auxiliary water flow, the impact velocity would remain below 25.1 fps, slightly higher than the 25 fps velocity recommended by ODFW. Water exiting the auxiliary flow system would travel horizontally between 3.8 and 5.3 feet at low tailwater levels, depending on the flow. A plunge pool with a minimum depth of 4 feet would be excavated at the auxiliary water discharge to reduce the potential for fish to impact the river bottom. The hydraulic conditions for four potential flow conditions in the auxiliary water trough and at the discharge are provided in Table 35.

Table 35. Modelled hydraulic conditions in proposed auxiliary flow trough

Upper Section						
Flow Condition	**Trough Depth (inches)**	**Meets ODFW Water Depth (≥ 4 inches)**	**Trough Velocity (ft/sec)**	**Meets ODFW Velocity (≥ 2 ft/sec)**	**Gate Opening height (Inches)**	**Meets ODFW Water Depth (≥ 4 inches)**
5 cfs	4.3	Yes	9.3	Yes	4.4	Yes
10 cfs	7.0	Yes	11.4	Yes	9.0	Yes
15 cfs	9.5	Yes	12.7	Yes	13.8	Yes
20 cfs	11.8	Yes	13.5	Yes	18.8	Yes
30 cfs	16.3	Yes	14.7	Yes	29.5	Yes
Lower Section						
Flow Condition	**Trough Depth (inches)**	**Meets ODFW Water Depth (≥ 4 inches)**	**Trough Velocity (ft/sec)**	**Meets ODFW Velocity (≥ 2 ft/sec)**	**Discharge Impact Velocity (ft/sec**	**Meets ODFW Impact Velocity (≤ 25 ft/sec)**
5 cfs	7.9	Yes	5.1	Yes	24.6	Yes
10 cfs	13.5	Yes	5.9	Yes	24.8	Yes
15 cfs	18.7	Yes	6.4	Yes	24.9	Yes
20 cfs	23.8	Yes	6.7	Yes	25.0	No
30 cfs	33.7	Yes	7.1	Yes	25.1	No

PacifiCorp's estimated capital cost for additional design, permitting, and construction of the auxiliary bypass flow system is $300,000. Construction is proposed for calendar year 2019 following receipt of a new license.

Upgrades to Project fish passage facilities were implemented in 1996 to satisfy conditions of the current license. The downstream fish passage facilities were constructed in consultation with and pursuant to interim fish passage criteria provided by ODFW and FWS in 1994. The existing facilities meet current state criteria for fish passage (Oregon Department of Fish and Wildlife, 2015) for all measured parameters with the exception of criteria for upstream jump height, ladder weir notch depth, and screen approach velocity.

Despite variances from the physical and/or hydraulic criteria, biological evaluation of the existing fish passage facilities demonstrated that these facilities provide effective, safe passage upstream and downstream of the dam for resident, native trout. Fish as small as 110 mm were observed successfully ascending the ladder during June and July of a water year that exhibited flows approaching historic lows. Seventy-three percent (n=719) of salmonids observed during mask-and-snorkel surveys of the bypassed reach were categorized in the 100-200 mm size class; only seventeen percent (n=170) of salmonids observed during mask-and-snorkel surveys of the bypassed reach were categorized in the 0-100 mm size class. Therefore, the ladder is effective for the majority of fish in the bypassed reach. Additionally, fish smaller than 110 mm are more likely to hold localized positions in the river and not migrate upstream do to physical constraints and life history needs. None of the evaluation fish recovered in the downstream bypass return system exhibited signs of injury from the screen, and physical inspection of the screen components, including rubber seals, indicates that the screen forms an effective barrier to entrainment in the Project waterway. Replacements of existing facilities are anticipated to yield limited, incremental benefits compared to the existing facilities and, therefore, are unjustified in light of their estimated cost.

ODFW recommended that PacifiCorp develop provisions to "improve both sweeping and approach velocities at the fish screen, the screen cleaning mechanism, screen mesh size, and bypass flow control" (Oregon Department of Fish and Wildlife, 2016). A new screen design would be required to meet all of the requested parameters in accordance with state criteria for fish passage facilities. PacifiCorp contracted engineering support from Alden to produce a conceptual design that could meet the physical criteria within the existing footprint of the diversion canal. A conceptual design for vertical fish screens, including approximately 47'-long primary screens, approximately 25'-long secondary screens, adjustable screen baffles, dual brush cleaners, and associated maintenance access was developed by Alden (Alden Research Laboratories, Inc., 2016). The range-of-magnitude estimate for construction of this fish screen concept, not including costs for additional engineering, price escalation, administration, and capital surcharges, was approximately $1.2 million. The value of potential generation lost during the estimated four months (July-October) of construction of a new screen system would result in an additional $146,220 of costs to the project. PacifiCorp's total costs for the Project are estimated at $1.47 million. The existing screen prevents entrainment of fish for approximately 95 percent of the year on average and has not been observed to result in delay, injury, or mortality in screened fish. Therefore, a new screen system is unjustified in light of the estimated cost. ODFW recommended that PacifiCorp develop a proposal for meeting fish ladder criteria, including jump height, energy dissipation, and attraction flows. The existing and proposed ladder, as modelled, meets state criteria for energy dissipation and attraction flows. The ladder

was observed to only exceed the criteria for jump height and weir notch depth at some of the weirs. PacifiCorp engineers analyzed options for bifurcating the existing fish ladder pools to decrease the jump heights over weir notches, which in some cases are twice the recommended height of six inches. PacifiCorp estimates that doubling the number of pools using the existing footprint of the fish ladder would cost approximately $250,000. Fish as small as 110 mm were observed successfully ascending the ladder, and therefore, upgrades of the fish ladder are anticipated to yield limited, incremental benefits that are unjustified in light of their estimated cost.

ODFW recommended "a new trash rack that has 9-inches of clear space between vertical members, and 12-inches of clear space between horizontal members" (Oregon Department of Fish and Wildlife, 2016). A new trash rack of the recommended dimensions would cost approximately $60,000. However, PacifiCorp does not recommend replacement or modification of the existing trash rack. An increase in the vertical and horizontal spacing would result in additional and larger debris entering the diversion canal and potentially increasing the number and frequency of back flush cleaning cycles required for maintenance of the fish screen. The existing trash rack cannot be modified do to the existing framing and HDPE construction. For prioritization of effective fish screen operation, the existing trash rack with 3 inch horizontal spacing should remain.

ODFW recommended that PacifiCorp "design, construct, and evaluate a new bypass pipe exit location near the entrance of the fish ladder" (Oregon Department of Fish and Wildlife, 2016). PacifiCorp contracted engineering support from Alden to produce a conceptual design for the fish bypass return pipe exit that would meet ODFW criteria and maximize the effectiveness of existing fish passage facilities. The preferred concept includes extending the existing bypass pipe over Pools 6 through 2 of the fish ladder and locating the discharge immediately downstream of Weir 2 into Pool 1 (Olken, 2016). Discharging bypassed fish and flows into Pool 1 is advantageous over discharging into the river because it would result in the maximum amount of attraction flow exiting the fishway. This alternative provides good egress for downstream migrants because they only have to swim over a single, submerged weir to exit the fishway.

The new section of the fish return bypass pipe would maintain the same slope (approximately 2 percent) and diameter (18 inches O.D.) as the existing bypass. Maintaining the same bypass slope and diameter results in uniform flow within the bypass pipe, reducing turbulence and the presence of any hydraulic jumps. This alignment is expected to result in a bypass velocity of up to 10.3 fps and a flow depth of 14.9 inches. The bypass exit would discharge parallel to the flow over Weir 2 at an exit invert elevation of 3364.7 feet, approximately 5.1 feet above the expected low water level in Pool 1. This height would prevent upstream migrating fish from entering the fish bypass pipe. Any fish that attempt to jump into the bypass pipe would land safely into either Pool 1 or 2. Discharging at 5.0 feet above the water surface results in an impact velocity of 21 fps, which is less than the maximum recommended velocity of 25 fps (NMFS 2011). At low water levels the average water depth in Pool 1 is approximately 3.8 feet. Water exiting the discharge would travel approximately 5.8 feet horizontally during low water and would not impact the far wall. The final slope and discharge height of the bypass would be refined as part of a more detailed hydraulic design.

The existing fish bypass up to the existing elbow would not require any modifications as part of this alternative. The existing elbow would be replaced with a new elbow with a 4 degree increase in bend greater than the existing elbow. Adjusting the angle of this bend allows the new bypass pipe to run over the existing fishway without impairing the ability to inspect the lower fishway weirs. A new section of bypass pipe would then slope down to Pool 1. The existing flared exit can be used to dissipate some of the discharge energy. The existing pipe supports would be moved and reused to support the section of bypass pipe over the embankment. New pipe supports built into the walls of Weirs 2, 4, and 6 would support the pipe over the fish ladder. These weir walls would be reinforced to handle the additional load of the bypass pipe.

PacifiCorp's estimated capital cost for additional design and construction of the fish bypass return pipe extension and discharge is $158,000. Construction is proposed for 2019 following receipt of a new license.

Relocating the fish bypass discharge from Pool 6 to Pool 1 would reduce the flow in the lower fishway (i.e., Pools 2-6). The flow in these pools would be approximately 4.9 cfs, at the maximum, no-spill reservoir elevation. This flow is consistent with flows in the upper fishway. Using the existing Excel based hydraulic model of the fishway, Alden evaluated modifications to the lower fishway weirs (Weirs 2-6) to provide similar or better hydraulic conditions as the upper fishway (water surface drop, depth over weir, velocity, etc.).

The weirs in the upper fishway (Weirs 7-15) are 1.5 feet wide. During modeled flow conditions the approximate water surface drop in the upper fishway was 1.25 feet between pools, with a 1.1 foot water depth over the weirs and a velocity of 3.0 fps at the weir crests. Similar conditions in the lower fishway would be achieved by reducing the width of the lower fishway weirs from 3.0 feet to 1.5 feet, consistent with the upper fishway. The weir crest elevations were not adjusted at this time because of uncertainty in the actual crest elevations. The hydraulic conditions and compliance with ODFW requirements in the upper and lower fishway associated with moving the bypass to Pool 1 and modifying the lower fishway weirs is provided in Table 36. As shown in Table 36, the lower fishway weirs would not meet ODFW drop height requirements, but would meet the minimum water height requirements. The actual height that fish would have to jump to move between pools would be less than the drop height between pools because fish would only have to jump several inches to enter the flow over the upstream weir. A plan and elevation view of the fishway changes, including modifications to the bypass pipe and the auxiliary flow trough are provided in Exhibit F, Appendix E.

PacifiCorp's estimated capital cost for additional design and construction of the modified fishway weirs is $41,000. Construction is proposed for 2019 following receipt of a new license.

PacifiCorp would operate the remaining fish ladder exit orifice in the fully open position. The dimensions of the exit orifice are 30 inches high by 16 inches wide. The exit orifice meets the minimum orifice dimension criteria of 15 inches high by 12 inches wide (Oregon Department of Fish and Wildlife, 2016).

Table 36. Impacts to physical criteria from relocating the fish bypass exit to Pool 1 and modifying Weirs 6 through 2

Pool/ Weir Number	Invert of Weir to Downstream Pool (ft)	Submerged Weir	WS Drop Between Pools (ft)	Meets ODFW Drop Height (≤ 0.5 ft)	Velocity Over Weir (ft/sec)	Meets ODFW Velocity (≤ 8 ft/sec)	Water Depth Over Weir (ft)	Meets ODFW Weir Depth (≥ 1 ft)	Average Pool Depth (ft)	Meets ODFW Pool Depth (≥ 2 ft)	Meets ODFW EDF[1]
15	-0.10	Yes	1.01	No	2.96	Yes	1.11	Yes	5.4	Yes	Yes
14	0.15	No	1.25	No	2.98	Yes	1.10	Yes	5.9	Yes	Yes
13	0.15	No	1.25	No	2.99	Yes	1.10	Yes	5.1	Yes	Yes
12	0.17	No	1.26	No	2.99	Yes	1.10	Yes	4.9	Yes	Yes
11	0.18	No	1.26	No	3.02	Yes	1.08	Yes	3.9	Yes	Yes
10	0.16	No	1.23	No	3.06	Yes	1.07	Yes	3.1	Yes	Yes
9	0.16	No	1.25	No	3.00	Yes	1.09	Yes	4.6	Yes	Yes
8	0.17	No	1.26	No	3.01	Yes	1.09	Yes	4.2	Yes	Yes
7	0.15	No	1.22	No	3.05	Yes	1.08	Yes	3.3	Yes	Yes
6	0.15	No	1.26	No	2.97	Yes	1.10	Yes	6.0	Yes	Yes
5	0.15	No	1.25	No	2.99	Yes	1.10	Yes	4.9	Yes	Yes
4	0.11	No	1.21	No	2.98	Yes	1.10	Yes	5.4	Yes	Yes
3	-0.26	Yes	0.88	No	2.89	Yes	1.14	Yes	5.4	Yes	Yes
2	-1.19	Yes	0.32	Yes	2.17	Yes	1.51	Yes	3.9	Yes	Yes
1	-2.00	Yes	1.19	No	4.21	Yes	3.19	Yes	3.9	Yes	Yes

ODFW noted that "the ladder should provide attraction flows totaling at least 10% of total river flow (not including diverted flows) at the site" (Oregon Department of Fish and Wildlife, 2016). Under the proposed Project conditions, flows in the bypassed reach would only exceed the minimum in-stream flow during April, May, and June when total inflow is greater than the combination of PacifiCorp's maximum diversion of 150 cfs and the minimum flow of 30 cfs. Under these conditions additional flows are spilled over the dam crest. The largest average monthly flow in the bypassed reach is expected in May at 207 cfs (see Table 7). Flow through the ladder entrance, including the combined flow through the fish ladder exit orifice and the fish return bypass pipe, exceeds 20 cfs according to the model. Attraction flows of approximately 20 cfs in May are approximately 10 percent (i.e., 20.7 cfs) of total river flow (not including diverted flows; i.e., 207 cfs) in the bypassed reach. During peak upstream migration in late June and early July, attraction flows of 20 cfs exceed 10 percent (i.e., 12 cfs) of total river flow (not including diverted flows; i.e., 120 cfs) in the bypassed reach.

PacifiCorp proposes to implement an updated Fish Passage Facilities Operations and Maintenance Plan, incorporating modified maintenance activities and schedules, and to continue operation and maintenance of the existing upstream and downstream fish passage facilities (see Volume III, Appendix B). The current draft plan would be updated following construction of fish passage facility modifications to reflect new facilities while retaining the same maintenance schedules. PacifiCorp's estimated cost for implementation of the Fish Passage Facilities Operations and Maintenance Plan is $5,000 per year.

Fish passage design drawings, which include non-public, critical energy infrastructure information (CEII), are not provided in Exhibit E but are available for authorized review in Volume IV, Exhibit F, Appendix D (Fish Passage Facilities As-built Plans) of this license application. Conceptual drawings of fish passage facility modifications are included in Volume IV, Exhibit F, Appendix E.

PacifiCorp also proposes to implement seasonal, operational ramping rates not to exceed 0.2 feet per hour from May 1 through September 30 and 0.3 feet per hour from October 1 through April 30 in the South Fork Rogue River. This ramping schedule is based on the ramp rates and periods established by the Prospect Nos. 1, 2, and 4 license for the bypassed reaches of Red Blanket Creek and Middle Fork Rogue River[16]. The ramp rates for these two streams were identified as protective of aquatic life, including sensitive life stages of native fish, based on a comprehensive ramping study (PacifiCorp, 2003). South Fork Rogue River is similar to Middle Fork Rogue River, in terms of discharge, hydrograph shape, and channel shape. The ramp rates were rounded to the nearest tenth of a foot to correlate compliance units with units of the gage (i.e., the compliance point) and reflect the level of operational control. PacifiCorp believes that the proposed rates, if adopted, would be protective of aquatic life in the bypassed reach. These ramping rates would be adhered to during any planned operational adjustment of the turbine wicket gates, pressure relief valve, turbine isolation valve, canal headgate, and/or fish screen backwater gate. Adherence to these proposed ramping rates would reduce the potential for

[16] May 1 through September 30, operational ramping should not exceed two inches per hour; October 1 through April 30, operational ramping should not exceed three inches per hour.

sediment mobilization on up ramps and fish stranding on down ramps. A communications link would be installed on the USGS gage at RM 10.25 to provide real-time feedback to PacifiCorp's control systems. PacifiCorp proposes to report any operational[17] ramping rates in excess of the defined rates within 24 hours of discovery to the Forest Service, DEQ, ODFW, and the Commission via electronic mail. PacifiCorp would prepare an annual summary report of operational ramping events for the prior water year (October 1 through September 30) by January 31 of each year. PacifiCorp's estimated costs for installation of the communications link and associated control systems is $35,000. PacifiCorp's estimated costs for monitoring and reporting of in-stream flow and ramping rates and operations and maintenance of associated facilities and equipment is $5,000 per year.

ODFW noted that the DLA did "not include an assessment of the project effects on bedload recruitment below project diversions" and suggested that "dredged materials from the South Fork Reservoir should be placed below the diversion dam" (Oregon Department of Fish and Wildlife, 2016). PacifiCorp proposes to place materials dredged from the impoundment upstream of the dam to the bank of the bypassed reach downstream of the dam via a spur road from the flowline vehicle-access bridge. The spur road would allow heavy equipment to place dredged material on the bank above open water such that materials can be naturally dispersed via high flows after the in-water work period for dredging ending September 15. PacifiCorp's estimated cost for construction of the spur road and landing above the 20 cfs water line is approximately $125,000.

E.6.3.4 Unavoidable Adverse Impacts

The South Fork Diversion Dam inhibits unencumbered upstream and downstream fish passage in the historic channel of the South Fork Rogue River. Some resident trout may be entrained in the Project waterway during fish screen back-flush cycles or plane-mode operation during icing or heavy debris loading, but fish exposure to these events is limited spatially by the size of the canal immediately upstream and adjacent to the fish screen and temporally by the normal operating mode of the engaged, sealed fish screen (four-year average of approximately 95% engaged). Physical dimensions of the existing fish ladder may hinder upstream passage for small fish (e.g., individuals less than 110 mm fork length, which was the smallest fish observed successfully ascending the fish ladder).

These identified adverse impacts to fish passage are generally minor despite long-term, cumulative effects (see E.6.3.5). Biological evaluation of the existing fish ladder indicates that fish as small as 110 mm fork length can successfully ascend the fish ladder in a reasonable amount of time (generally less than 24 hours) during low flows (generally less than 100 cfs total inflow to the Project during the evaluation). No apparent injury was noted on recaptured, screen-bypassed fish during the evaluation. No fish were found impinged on the fish screen following the evaluation, and potential surface irregularities that could cause injury or gaps that could cause entrainment were not observed. The existing fish passage facilities provide substantial,

[17] Due to the ungated, ogee spillway at the diversion, ramping rates in excess of the proposed rates are regularly experienced due to natural fluctuations of incoming flows. PacifiCorp is only proposing to report ramping rate incidents resulting from operation of the Project facilities and not natural fluctuations.

safe, upstream and downstream passage, and therefore genetic exchange, opportunities for resident trout.

The diversion dam also restricts the unobstructed mobilization of sediment, and more specifically gravels suitable for resident trout spawning, in the channel. Diversion of up to 150 cfs from the South Fork Rogue River for power generation reduces the amount of available fish habitat in the bypassed reach. In light of the constrained, steep channel of the bypassed reach, these impacts to fish habitat are minor, despite their long-term, cumulative nature.

E.6.3.5 Cumulative Effects

Other diversion dams on the North and Middle Fork Rogue, Buck Creek, and Red Blanket Creek limit unhindered fish passage in the analysis watersheds, and South Fork Diversion Dam contributes to the cumulative, adverse effects on fisheries in the watershed. However, the incremental fishery resource impacts of the Project when added to other activities that may cumulatively affect fishery resources are negligible within the analysis watersheds during the current license term and the proposed Project term. Extensive electrofishing and angling surveys were conducted by ODFW biologists in the analysis watersheds in 2010 and 2011 to assess species composition, abundance, distribution, size, age, and general health of trout in the basin (Oregon Department of Fish and Wildlife, 2012). Fulton condition factors were calculated as an overall indicator of "fitness," such that fish with higher condition factors are heavier per unit body length than fish with lower condition factors. Generally salmonids with a condition factor of greater than 1.0 are considered "fit." Condition factors for the 732 naturally-produced (i.e., non-hatchery) cutthroat and rainbow trout averaged 1.09, with little (less than ten percent) variation across sampling sites in the three (North, Middle, South) forks of the Rogue River at locations both upstream and downstream of diversions. The naturally-reproducing, self-sustaining population of native fish in the analysis watershed is producing "fit" fish.

ODFW stocks hatchery rainbow trout at four primary locations within the analysis watersheds: Lost Creek Reservoir, Rogue River upstream of Lost Creek Reservoir, Union Creek, and Medco Pond, which is within the South Fork drainage and to the southwest of the Project (Oregon Department of Fish and Wildlife, 2016). Hatchery trout are used by ODFW to supplement natural stocks and provide additional angling opportunities (Oregon Department of Fish and Wildlife, 2016).

In 1994, with adoption of the Record of Decision for the Northwest Forest Plan (USDA and USDI, 1994), much of the analysis watershed was designated as "Late-Successional Reserve" and was excluded from logging operations. Continued implementation of the restoration strategy of the Northwest Forest Plan would result in a net decrease of roads, an increase in vegetation cover, a reduction in sediment yield, and an increase in water quality (USDA Forest Service, 1998), which would all benefit fishery resources.

Implementation of the environmental measures proposed to address impacts to fisheries would increase flows in the bypassed reach to provide additional fish habitat, establish ramp rates to reduce potential for fish stranding during operational reductions in river stage, and reduce

sediment mobilization. Therefore, the impact of the proposed Project would likely have a positive effect on the cumulative impacts to fisheries within the analysis watersheds during a proposed license term compared to the no action alternative.

E.6.4 Wildlife Resources

E.6.4.1 Affected Environment

The Project is located primarily on the western slope of the High Cascade Mountains between the South Fork and North Fork Rogue River. The Project descends 895 feet in elevation from east to west. The South Fork diversion dam is located at 3,375 feet, while the powerhouse and Prospect substation are located at 2,635 feet and 2,480 feet, respectively. The Project alignment transitions from federally owned lands of the Rogue River-Siskiyou National Forest to PacifiCorp-owned property, which runs through private timber company holdings and rural developments associated with the community of Prospect. These gradients of elevation, ownership, and land use result in heterogeneous wildlife habitat values across rather homogenous habitat types and vegetation associations.

GIS data sets from the Northwest Habitat Institute (NWHI) (National Weather Service, 2013) were used to analyze wildlife habitat within the Project Vicinity. Three primary wildlife habitat types exist within the Project Vicinity: riparian, open water/wetland, and southwest Oregon mixed conifer-hardwood forest. Many wildlife species are associated with mixed conifer-hardwood forest and may be found within the Project Vicinity. Big game species, which are important for their commercial and recreational hunting value, typically use the forest for both forage and cover. Forest trees also provide the necessary structure, food, and cover for many neo-tropical migrant birds. Snags and live, deformed trees of various diameters and heights provide forage for woodpeckers, as well as nest sites for cavity nesting birds.

A significant portion (>30%) of the Project Vicinity is subject to regular, commercial timber harvest operations. Regenerating forest plots are comprised of various heights and age classes of timber production species, primarily Douglas-fir and ponderosa pine. In the first five to ten years following harvest, grass and forb species flourish in the lack of canopy cover. These openings can provide important forage and browse habitat for black-tailed deer (*Odocoileus hemionus* ssp. *columbianus*) and elk (*Cervus elaphus*).

An extensive camera-trapping study was conducted continuously for three years within the Project Vicinity (Albertelli, 2012). The following mammal species were identified during the study: American marten (*Martes americana*), black bear (*Ursus americanus*), black-tailed deer, bobcat (*Lynx rufus*), chipmunk (*Tamias* sp.), common raccoon (*Procyon lotor*), cougar (*Puma concolor*), coyote (*Canis latrans*), elk, golden-mantled ground squirrel (*Spermophilus lateralis*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), and western gray squirrel (*Sciurus griseus*). In addition to these species, fisher (*Pekania pennanti*) and ringtail (*Bassariscus astutus*) were observed during preliminary camera testing (Albertelli, Personal Observations, 2013).

Common avian species observed during surveys within the Project Vicinity in 2001 (PacifiCorp, 2003) include the following: American robin (*Turdus migratorius*), cliff swallow (*Petrochelidon pyrrhonota*), common merganser (*Mergus merganser*), dark-eyed junco (*Junco hyemalis*), golden-crowned kinglet (*Regulus satrapa*), lazuli bunting (*Passerina amoena*), MacGillivray's warbler (*Oporornis tolmiei*), mallard (*Anas platyrhynchos*), red-breasted nuthatch (*Sitta canadensis*), red-winged blackbird (*Agelaius phoeniceus*), song sparrow (*Melospiza melodia*), spotted towhee (*Pipilo maculatus*), Swainson's thrush (*Catharus ustulatus*), tree swallow (*Tachycineta bicolor*), yellow-rumped warbler (*Dendroica coronata*), and yellow warbler (*Dendroica petechia*). Raptors regularly observed in the vicinity include turkey vultures (*Cathartes aura*), osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), accipiters (*Accipiter* spp.), red-tailed hawk (*Buteo jamaicensis*), and American kestrel (*Falco sparverius*). Amphibians observed within the Project Vicinity include Cascades frogs (*Rana cacadae*), Pacific tree-frogs (*Pseudacris regilla*), coastal tailed frogs (*Ascaphus truei*), Northwestern salamanders (*Ambystoma gracile*), Pacific giant salamander (*Dicamptodon tenebrosus*), and rough-skinned newt (*Taricha granulosa*) (PacifiCorp, 2003). Reptiles observed within the Project Vicinity include northwestern pond turtle (*Actinemys marmorata*), western fence lizard (*Sceloporus occidentalis*), northern alligator lizard (*Elgaria coerulea*), southern alligator lizard (*Elgaria multicarinata*), western skink (*Eumeces skiltonianus*), common garter snake (*Thamnophis sirtalis*), northwestern garter snake (*Thamnophis ordinoides*), gopher snake (*Pituophis catenifer*), racer (*Coluber constrictor*) (PacifiCorp, 2003), and western rattlesnake (*Crotalus viridis*) (Albertelli, Personal Observations, 2013).

The Initial Wildlife Study Report (Report) (PacifiCorp, 2015) was prepared in fulfillment of Section 3.3 (Wildlife Study) of the approved Revised Terrestrial Resources Study Plans (Study Plan) (PacifiCorp, 2014) and the requirements of 18 CFR § 5.15 (c) (1) of the FERC ILP. The primary objective of the Wildlife Study was to provide information on species composition, distribution, and movement within the Project Area. The Report characterized existing wildlife communities within the Study Area with emphasis on identifying species listed as endangered or threatened by Oregon Department of Fish and Wildlife (ODFW) or U.S. Fish and Wildlife Service (FWS), included on the Regional Forester's list of sensitive species, and/or identified as Northwest Forest Plan (NFP) survey and manage species (addressed herein in Section E.6.7). The Report also characterized observations of large mammal travel routes through the Study Area.

The Wildlife Study Area included approximately 286 acres within and adjacent to the existing FERC Project boundary from the diversion dam to the sag-pipe, including lands owned by PacifiCorp or Forest Service. On Forest Service lands, the Study Area is bounded by the 3775800 road on the north and the FERC boundary on the east and south, thereby encompassing any potential flowline access points. On PacifiCorp lands, the Study Area included the area of ownership bounded by the Forest boundary on the east, the FERC boundary to the south of the flowline, the PacifiCorp property boundary to the south and west of the canal, and the Middle Fork Canal at the northern terminus of the sag-pipe. The transmission line corridor was excluded from the Study Area due to the availability of existing survey data (as presented in the preceding paragraphs).

The Wildlife Study was completed in the first study season (May 2014 to May 2015) pursuant to the methods outlined in the Study Plan. A total of 420 observations of fifty-one distinct, identifiable species were recorded during the walking surveys. The species list is provided in Table 37. Thirty-seven of the fifty-one species observed (73 percent) were birds. Bird observations (*n*=210) accounted for fifty percent of all observations, of which the majority were identified by sound (*n*=143). One hundred fifty-two of the total observations were ungulates, with deer and elk accounting for 117 (28 percent) and 35 (8 percent) of the total observations, respectively.

Table 37. Wildlife Species Observed During Relicensing Studies (2014-2015)

Common Name	Scientific Name	Federal Status	ODFW State Status (Western Cascades Ecoregion)	Other Listing (e.g. S/M, Regional Forester's List, et. al)
Birds				
American dipper	*Cinclus mexicanus*			
American robin	*Turdus migratorius*			
Belted kingfisher*	*Megaceryle alcyon**			
Black-capped chickadee	*Poecile atricapillus*			
Brown creeper	*Certhia americana*			
Bullock's oriole	*Icterus bullockii*			
Bushtit	*Psaltriparus minimus*			
Chestnut-backed chickadee	*Poecile rufescens*			
Common raven	*Corvus corax*			
Cooper's hawk	*Accipiter cooperii*			
Dark-eyed junco	*Junco hyemalis*			
Downy woodpecker	*Picoides pubescens*			
Fox sparrow	*Passerella iliaca*			
Golden-crowned kinglet	*Regulus satrapa*			
Hairy woodpecker	*Picoides villosus*			
Hermit warbler	*Setophaga occidentalis*			
Hutton's vireo	*Vireo huttoni*			
Lazuli bunting	*Passerina amoena*			
Lesser goldfinch	*Spinus psaltria*			
Mountain chickadee	*Poecile gambeli*			
Mountain quail	*Oreortyx pictus*	SOC	S-V	
Nashville warbler	*Oreothlypis ruficapilla*			
Northern flicker	*Colaptes auratus*			
Northern pygmy-owl	*Glaucidium gnoma*			
Olive-sided flycatcher	*Contopus cooperi*		S-V	

Common Name	Scientific Name	Federal Status	ODFW State Status (Western Cascades Ecoregion)	Other Listing (e.g. S/M, Regional Forester's List, et. al)
Pacific slope flycatcher	*Empidonax difficilis*			
Pacific wren	*Troglodytes pacificus*			
Pileated woodpecker	*Dryocopus pileatus*			
Red-breasted nuthatch	*Sitta canadensis*			
Red-breasted sapsucker	*Sphyrapicus ruber*			
Red-tailed hawk	*Buteo jamaicensis*			
Spotted towhee	*Pipilo maculatus*			
Steller's jay	*Cyanocitta stelleri*			
Turkey vulture	*Cathartes aura*			
Western tanager	*Piranga ludoviciana*			
Western wood peewee	*Contopus sordidulus*			
Yellow-rumped warbler	*Setophaga coronata*			
Amphibians				
Cascades frog*	*Rana cascadae**		S-V	
Coastal giant salamander*	*Dicamptodon tenebrosus*			
Coastal tailed frog*	*Ascaphus truei**		S-V	
Ensatina	*Ensatina eschscholtzii*			
Northwestern salamander	*Ambystoma gracile*			
Pacific treefrog	*Pseudacris regilla*			
Reptiles				
Northern alligator lizard	*Elgaria coerulea*			
Sagebrush lizard	*Sceloporus graciosus*			
Western skink*	*Plestiodon skiltonianus**			
Mammals				
Black bear	*Ursus americanus*			
Black-tailed deer	*Odocoileus hemionus columbianus*			
Cougar	*Puma concolor*			
Coyote	*Canis latrans*			
Douglas' squirrel	*Tamiasciurus douglasii*			
Elk	*Cervus canadensis*			
Fisher*	*Pekania pennanti**		S-C	
Gray fox	*Urocyon cinereoargenteus*			
Gray wolf*	*Canis lupus**	LE		

Common Name	Scientific Name	Federal Status	ODFW State Status (Western Cascades Ecoregion)	Other Listing (e.g. S/M, Regional Forester's List, et. al)
Pacific jumping mouse	*Zapus trinotatus*			
Trowbridge's shrew	*Sorex trowbridgii*			
Red tree vole	*Arborimus longicaudus*	C		S/M C
Western gray squirrel	*Sciurus griseus*			
Invertebrates				
"Medford No. 1"	*Vespericola* sp.			
Blue-gray taildropper	*Prophysaon coeruleum*			
Brown hive	*Euconulus fulvus fulvus*			
Conical spot	*Punctum randolphi*			
Lancetooth species	*Haplotrema* sp.			
Quick gloss	*Zonitoides arboreus*			
Redwood hesperian	*Vespericola megasoma*			
Siskiyou hesperian	*Vespericola sierranus*			OR-SEN
Vertigo species	*Vertigo* sp.			

*Incidental species observations outside of focused walking surveys

Three listed species were observed during walking surveys. The listed species and their listing status are as follows:

- mountain quail (*Oreortyx pictus*) – Federal: Species of Concern; State: Sensitive-Vulnerable
- olive-sided flycatcher (*Contopus cooperi*) – State: Sensitive-Vulnerable
- red tree vole (*Arborimus longicaudus*) – Federal: Candidate; NFP Survey and Manage, Category C

The red tree vole observation was limited to an unconfirmed red tree vole nest, which did not appear to be in active use. Nest material consisted of conifer cuttings of a size (5 to 20 centimeters (cm)) and diameter (<0.5 cm) indicative of red tree vole nests (Huff, Van Norman, Hughes, Davis, & Mellen-McLean, 2012). However, the nest material was decomposing and no diagnostic resin ducts were observed on the ground below the nest. The Study Area is outside of the red tree vole protocol survey zones.

Protocol surveys within the Study Area resulted in 129 observations of nine terrestrial mollusk species. *Vespericola sierranus*, a listed sensitive invertebrate on the Regional Forester's Special Status Species List, was observed thirteen times during surveys. Three live voucher specimens of

an unidentified *Vespericola* species were sent to Barry Roth, Forest Service Portland Regional Office terrestrial mollusk taxa expert, for species verification. The voucher specimens were identified as an undescribed *Vespericola* species currently designated as "Medford No. 1." Medford No. 1 is locally abundant and accounted for the majority (*n*=54; 42%) of mollusk observations, but this species may be a candidate for listing based on its heretofore undescribed status. No other special status terrestrial mollusk species were observed.

Pre-field-survey interviews with on-site Project staff revealed that one operator observed a fisher (*Pekania pennanti*) on the access road to South Fork diversion dam on Forest Service property in approximately April 2013 (Gibson, 2014). This observation is consistent with fisher observations during the wildlife crossing evaluation conducted on the adjacent Prospect Nos. 1, 2, and 4 Hydroelectric Project (Albertelli, 2012) and radio-telemetry studies within the Project Vicinity (Aubry, 2006). A second operator reported a fisher sighting on the banks of the South Fork Rogue downstream of the diversion dam in October 2015 (Jones, 2015).

Cascades frogs (*Rana cascadae*) have been observed below the sag-pipe by Project staff (Albertelli, 2013), but they were not observed on the survey route below the sag-pipe during the walking surveys.

In addition to a number of species also observed during PacifiCorp walking surveys, Sheila Colyer, High Cascades Ranger District Wildlife Biologist, incidentally observed the following additional species during special status species surveys in the Study Area: belted kingfisher (*Megaceryle alcyon*), western skink (*Plestiodon skiltonianus*), and northwestern salamander (*Ambystoma gracile*).

Wildlife travel routes were recorded during surveys to provide data on wildlife connectivity and the adequacy of existing wildlife crossings as presented in Scoping Document 2. Twenty-seven travel routes were observed during walking surveys. Five of the transects and/or walking survey routes coincided with established wildlife crossings (bridges or undercrossings). Tracks and/or travel routes were identified on all five of these wildlife crossings.

Travel routes on the plateau between the South Fork Rogue and Middle Fork Rogue Rivers were more variable in direction than travel routes on canyon slopes, which exhibited a predominance of routes that were generally parallel (i.e. less than forty-five degrees) to the contour of the slope. On the southwest-facing, northeast bank of the South Fork Rogue (Transects 1-3), fifty percent (*n*=4) of the travel routes exhibited a northwesterly travel direction, which is generally parallel to the contour of the slope and the adjacent flowline. On the plateau between the South and Middle Forks (Transects 4-10), travel routes exhibited a predominantly (57 percent) westerly direction of travel. On the north-facing, south side of the Middle Fork Rogue canyon (Transects 11-15), fifty percent (*n*=6) of the travel routes exhibited a westerly direction of travel, which is generally parallel to the contour of the slope and perpendicular to the adjacent penstock. Observed travel routes perpendicular to the penstock exhibited wildlife use of the penstock undercrossings, as well as non-dedicated crossing locations that exhibited enough vertical clearance between the ground and the penstock to permit animals to pass beneath the penstock.

None of the observed travel routes appeared to be blocked and rerouted by Project waterways. Routes were observed travelling parallel and immediately adjacent to Project waterways (see Transects 3 and 14), but there were no observed indications of a direction of travel perpendicular to the Project waterway prior to the parallel direction of travel.

E.6.4.2 Project Effects

Project operations and maintenance result in limited direct impacts (e.g., mortality, sound disturbance, et al.) to wildlife. Canal fencing precludes most species larger than the two-inch by four-inch wire spacing from becoming entrained in the canal. Those species that may fit through the canal fencing and/or squeeze through gaps at gated access points can potentially become entrained in the canal. The canal walls consist of rough concrete at an approximately 40 degree angle (1:1.25) from the canal base and are regularly covered with bryophyte growth and overhanging vegetation for several inches of "freeboard" above the water surface. These conditions provide traction and potential escape routes for small mammals or herptiles that may pass over the transition from adjacent terrestrial habitat to the canal during normal operation. Species that utilize leaping for locomotion may be more susceptible to canal entrainment, but any risk of mortality is offset by a species ability to swim in flowing water.

Project operations at the canal intake and fish screens, forebay and penstock intake, and powerhouse may contribute to above-ambient noise levels. With the exception of the powerhouse, these facilities produce noise of a limited duration and frequency that is more likely to affect localized dispersal of individuals than breeding or rearing activities. The powerhouse noise has the potential to impact wildlife demography and habitat selection in the vicinity of the powerhouse.

The Project transmission line presents an electrocution and/or collision risk for birds in the Project Area. A review of PacifiCorp's corporate-wide Bird Mortality and Problem Nest Reporting Database reveals that no bird mortalities have been reported during the period of record (January 1, 2001 through April 2016). Transmission and distribution line maintenance within the Project Area is subject to PacifiCorp's raptor-safe construction standards, which meet or exceed the Avian Power Line Interaction Committee (APLIC)'s *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006.*

Project impacts to wildlife are primarily indirect through the removal or degradation of habitat. Maintenance of waterway alignments and roads necessitates the removal of vegetation, which alters the habitat type, reduces vertical complexity, and removes potential wildlife habitat components. The planned replacement of the flowline would remove approximately 0.40 acres of second-growth forest for temporary construction access and staging to the north of the flowline terminus. Clearing of trees would have short-term impacts on species that rely on forest canopy and understory, but sub-soiling and replanting of the temporary staging and access areas can provide short-term meadow and shrub habitat and long-term forest regeneration to benefit wildlife. Remaining forest adjacent to the proposed clearing would continue to provide forest canopy and cover within the Project Area.

No federally- or state-listed threatened or endangered species were detected within the Study Area during surveys. However, federally- and state-listed endangered gray wolves (*Canis lupus*) utilize habitat in the Study Area. These species utilize large home ranges, of which the Study Area (286 acres or 0.44 square miles) would only be a small portion, and it is assumed that Project operations and maintenance would have negligible effects on these species. The Rogue wolf pack's breeding male paired with a female and produced three pups in 2014, establishing a territory in the eastern Rogue Unit, which includes the South Fork Rogue River watershed. The breeding male is collared with a GPS-radio collar, and GPS location data indicates that the pack area of use is approximately 355 square miles (Oregon Department of Fish and Wildlife, 2015). Wolf scat was incidentally observed on Imnaha Road in June 2015 (Albertelli, 2015).

The mollusk species observed in the Study Area are locally abundant, and continued operations and maintenance are unlikely to adversely affect these species across their range. The removal of large woody debris for ground-disturbing activities can degrade or displace potential terrestrial mollusk habitat. The results of additional Forest Service investigations regarding Medford No. 1 would inform analysis of Project impacts on this heretofore undescribed species.

The one federally-listed avian species of concern observed within the Study Area, mountain quail, are not likely to be affected by ongoing Project operations. If future management actions require large areas of vegetation removal, snags and taller perch trees should be retained, where feasible. Mountain quail may prefer brushy scrub-shrub habitats in regenerating areas following vegetation removal (e.g. canal brushing or flowline construction staging area clearing) over mature forested habitats.

Project waterways bisect terrestrial habitats and may limit habitat connectivity. These effects are pronounced for species with home ranges that are smaller than the interval between waterway crossing opportunities. The flowline, penstock, and sag-pipe are elevated and provide nearly continuous crossing opportunities for small- (e.g., rodents, herptiles) and medium-sized (e.g., gray fox, marten) species and several undercrossing opportunities for large species in addition to the two and five dedicated undercrossings on the flowline and penstock, respectively. Seven crossings (one vehicle bridge and six wildlife crossings) provide habitat connectivity across the canal section of the waterway for an average crossing interval of 829 feet (see Revised Study Plan, Appendix D for additional information regarding the existing wildlife crossings).

Wildlife crossings coincident with survey transects exhibited wildlife use. Project over- and under-crossings have been present for several generations of wildlife, and research suggests that wildlife become habituated to crossing structures within two to five years (Clevenger & Waltho, 2003; Dodd, Gagnon, Manzo, & Schweinsburg, 2007). Survey results indicate that wildlife regularly find and utilize Project crossing structures without having to travel parallel to Project features that may obstruct habitat connectivity.

Wildlife travel routes were observed travelling parallel and immediately adjacent to the penstock. It is possible that these individuals were moving consistent with the "law of least effort" and utilizing a relatively planar, unobstructed surface. It is unlikely that the penstock represented an obstruction to habitat connectivity for observed wildlife because the travel routes

in question pass undercrossings of vertical clearance sufficient to pass medium- to large-sized species. Parallel travel routes were observed in the vicinity of but not immediately adjacent to the flowline. These travel routes follow the topographic contour of the slope along the South Fork Rogue canyon and did not exhibit vectors indicative of an obstructed approach to the flowline.

Scoping Document 2 identified potential effects of Project operation and maintenance on Forest Service Survey and Manage (S/M) species and culturally important aquatic wildlife species, including beaver (FERC, 2013). No S/M terrestrial mollusk species were identified in the Study Area during protocol surveys conducted by Forest Service staff. The only S/M species observation was an unconfirmed and suspected inactive red tree vole nest on the plateau above the flowline. The Study Area is outside of the red tree vole S/M protocol survey area, which is bounded on the south by the Middle Fork Rogue River. Therefore, it is unlikely that the Project would have measurable effects on S/M species.

Beaver were not observed during surveys, but it is reasonable to assume their presence in the Project vicinity due to the mapped stream gradient of less than 15 percent, permanence of water, and known range (Allen, 1982). The Project may impact beaver through the alteration of the natural hydrology in the South Fork Rogue. However, beaver exhibit preference for stable water regimes (Allen, 1982), and the diversion dam may attenuate variability of peak flows in the bypassed reach. The proposed Project would further reduce the magnitude of difference between peak flows and base flows via the proposed minimum in-stream flow of 30 cfs from March 1 through July 31 and 20 cfs from August 1 through February 28, which would also expand the available bank habitat for beaver. The stated impacts to beaver are not of sufficient magnitude to rule out the suitability of habitat within the area of Project influence.

E.6.4.3 Proposed Environmental Measures

To address questions of existing wildlife crossing width, reduce long-term maintenance needs, and provide consistent wildlife crossing designs, PacifiCorp proposes to upgrade the six existing four-foot-wide Project wildlife crossings to twelve feet in width. Crossing construction and materials would be consistent with wildlife crossings at the Prospect Nos. 1, 2, and 4 Project that have proven to be successful in allowing passage for all size classes of wildlife in the Project Vicinity. Crossing structures would utilize pre-cast concrete panels covered with a minimum of two inches of native soil and woody debris along one side of the canal fencing to provide simulated ground cover for small mammals and herptiles. Large boulders would be installed at four-foot intervals in a ten-foot radius from the crossing entrances to prevent vehicle access. Based on study results and habituation of wildlife to existing structures, PacifiCorp does not recommend relocating crossings from their existing locations.

Planned replacement of the flowline provides an opportunity to construct additional wildlife crossings of this facility, as requested by Forest Service at the Proposed Study Plan meeting on January 28, 2014. Preliminary engineering designs have identified locations for five dedicated over- or under-crossings to be constructed concurrent with flowline replacement in 2021 (see Volume IV, Appendix F-3). At ODFW's request, PacifiCorp would provide ODFW with

proposed locations for the wildlife crossings prior to approval and construction. ODFW would have fifteen days to review and provide input on the proposed locations. PacifiCorp would consider ODFW's input and endeavor to resolve differences, but final site selection rests with PacifiCorp, as approved by FERC and, for federal lands, Forest Service.

To address concerns regarding habitat connectivity and canal entrainment risk for small wildlife species, PacifiCorp proposes to construct eight small wildlife crossings across the open canal. These crossings would be two feet wide and consist of a pre-cast concrete panel with a minimum of two inches of native soil covering. At ODFW's request, PacifiCorp would provide ODFW with proposed locations for the wildlife crossings prior to approval and construction. ODFW would have fifteen days to review and provide input on the proposed locations. PacifiCorp would consider ODFW's input and endeavor to resolve differences, but final site selection rests with PacifiCorp. In addition to the existing six wildlife crossings and Imnaha Road bridge, these eight crossings would provide an average crossing opportunity interval of 387 linear feet.

Future brushing of waterways to facilitate facility inspections should consider retaining overstory trees that do not block sight lines of the facility or pose a threat to infrastructure. Retained overstory trees may provide plant species diversity and structure to benefit wildlife species that nest, perch, or forage in trees. Large woody debris should be retained in-situ or relocated for terrestrial mollusk habitat when possible if operations and maintenance necessitate ground-disturbing activities.

Construction of the identified wildlife crossings is estimated at $259,000, and annual maintenance costs are estimated at $2,000 per year.

E.6.4.4 Unavoidable Adverse Impacts

Small wildlife species that may fit through the canal fencing and/or squeeze through gaps at gated access points can potentially become entrained in the canal. Impacts to potentially-affected species are minor, long-term, and site-specific.

Project operations at the canal intake and fish screens, forebay and penstock intake, and powerhouse would continue to contribute to above-ambient noise levels that may result in minor, long-term, site-specific unavoidable adverse impacts to localized dispersal, demography, and habitat selection of wildlife.

Project vegetation management, including the removal of hazard trees and clearing of waterway alignments, may impact wildlife by the removal or degradation of habitat elements.

E.6.4.5 Cumulative Effects

Continued operation of the Project would not significantly contribute to cumulative effects to wildlife resources within the analysis watersheds during the potential term of a new license. The primary threat to wildlife within the analysis watersheds during past licenses and the potential

term of a new license would continue to be habitat degradation and/or removal, primarily via commercial logging operations. Lands within the Project boundary represent less than one-tenth of one percent (0.0009) of the analysis watersheds, and therefore, Project impacts are proportionally insignificant to cumulative effects at the scale of the analysis watersheds. The overwhelming majority of lands within the analysis watersheds are federally-owned, subject to comprehensive environmental regulations, and are not currently proposed for significant development or habitat modification. In addition Project lands between the South and Middle Forks of the Rogue River provide a relatively intact wildlife corridor with both thermal and hiding cover when compared to the actively managed and recently logged private timber company lands on both sides of the Project alignment.

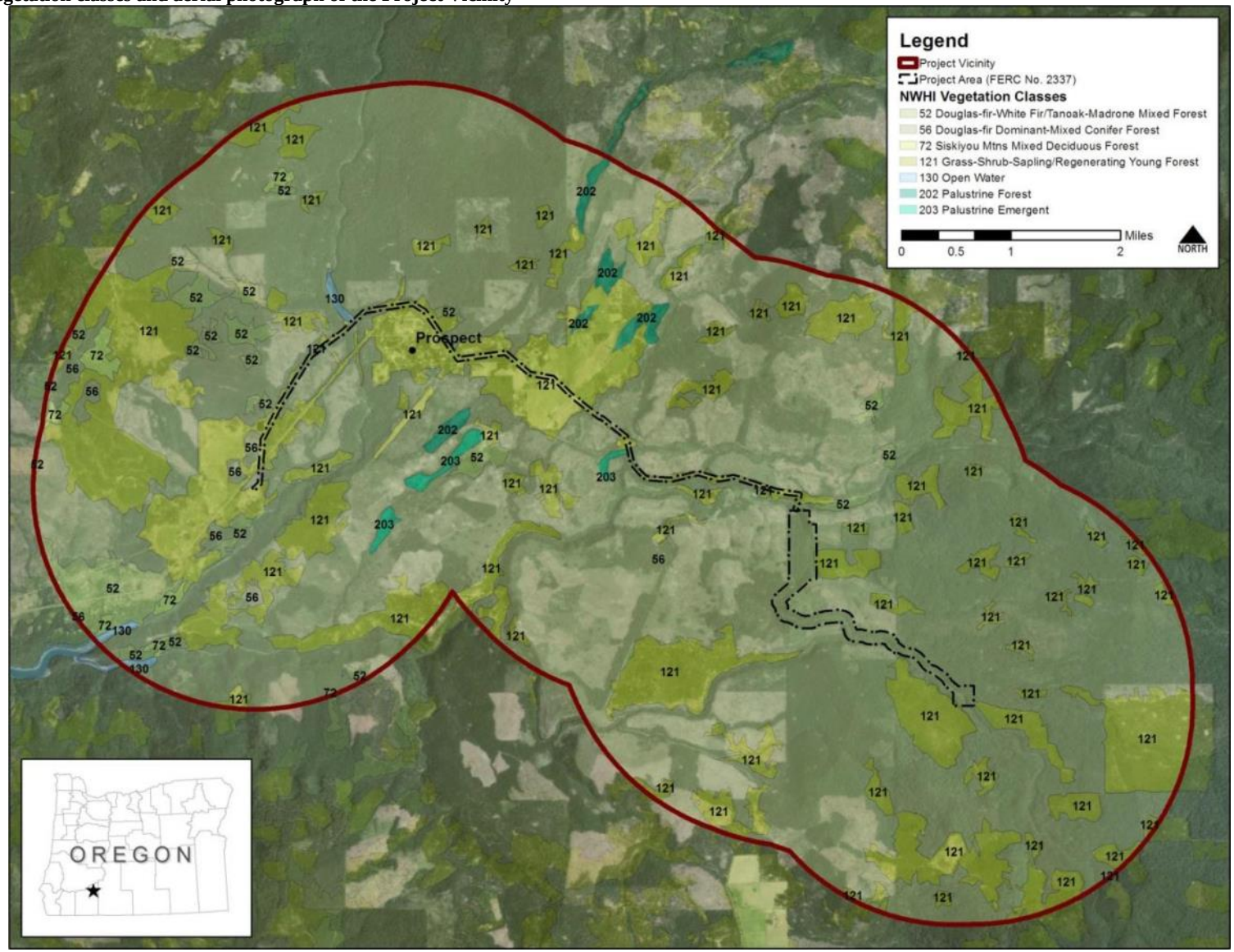
E.6.5 Botanical Resources

E.6.5.1 Affected Environment

The Project is located primarily on the western slope of the High Cascade Mountains between the South Fork and North Fork Rogue River. The Project descends 895 feet in elevation from east to west. The South Fork diversion dam is located at 3,375 feet, while the powerhouse and Prospect substation are located at 2,635 feet and 2,480 feet, respectively. The Project alignment transitions from federally owned lands of the Rogue River-Siskiyou National Forest to PacifiCorp-owned property, which runs through private timber company holdings and rural developments of the community of Prospect. These gradients of elevation, ownership, and land use result in heterogeneous habitat values across rather homogenous habitat types and vegetation associations.

GIS data sets from the Northwest Habitat Institute (NWHI) (Northwest Habitat Institute, 2000) were used to analyze wildlife habitat and vegetation types within the Project Vicinity. Three primary wildlife habitat types exist within the Project Vicinity: riparian, open water/wetland, and southwest Oregon mixed conifer-hardwood forest. Within the mixed conifer-hardwood forest habitat type, the following NWHI vegetation types were identified within the Project Vicinity: Douglas-fir dominant–mixed conifer forest (23,178 ac.), grass-shrub-sapling or regenerating young forest (7,558 ac.), Douglas-fir-white fir/tanoak-madrone mixed forest (853 ac.), palustrine forest (181 ac.), Siskiyou Mountains mixed deciduous forest (148 ac.), palustrine emergent (96 ac.), and open water (54 ac.). Figure 11 shows an aerial image of the Project Vicinity and vegetation types.

Figure 11. NWHI vegetation classes and aerial photograph of the Project Vicinity



Forested areas associated with the Project are a mix of coniferous and deciduous trees dominated by Douglas-fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), and western hemlock (*Tsuga heterophylla*). Other common tree and shrub species include sugar pine (*Pinus lambertiana*), ponderosa pine (*Pinus ponderosa*), incense cedar (*Calocedrus decurrens*), vine maple (*Acer circinatum*), big leaf maple (*Acer macrophyllum*), chinquapin (*Castanopsis chrysophylla*), California hazel (*Corylus cornuta*), Pacific dogwood (*Cornus nuttalli*), Pacific ninebark (*Physocarpus capitatus*), Oregon white oak (*Quercus garryana*), and madrone (*Arbutus menziesii*). The trees vary in size from young seedlings to large mature trees (> 30 in. diameter at breast height). The canopy cover varies from fairly open (40 percent) to dense ($\geq$75 percent). Depending upon the canopy cover and aspect, the understory ranges from relatively open areas comprised of grasses and forbs with isolated shrubs to bare ground with thick layers of duff. Common understory shrubs and forbs include Oregon grape (*Berberis nervosa*), squawcarpet (*Ceanothus prostratus*), oceanspray (*Holodiscus discolor*), twinflower (*Linnaea borealis*), brackenfern (*Pteridium aquilinum*), thimbleberry (*Rubus parviflorus*), and whipplevine (*Whipplea modesta*). In forest stands with dense canopy cover, sugarstick (*Allotropa virgata*) and prince's-pine (*Chimaphila umbellate*) are common understory species (PacifiCorp, 2003).

A significant portion (>30%) of the Project Vicinity is subject to regular, commercial timber harvest operations. Regenerating forest plots are comprised of various heights and age classes of timber production species, primarily Douglas-fir and ponderosa pine. In the first five to ten years following harvest, grass and forb species flourish in the lack of canopy cover. These openings can provide important forage and browse habitat for black-tailed deer and elk. On non-federal lands, mixed conifer forest is the exception to the rule of regenerating young forest. Few large tracts of intact forest remain; watercourses are easily delineated from aerial photography due to the network of trees remaining as riparian buffers.

The High Cascades are botanically less diverse than the adjacent Klamath and Siskiyou Mountains. Soil chemistry and precipitation are dominant influences in species diversity and composition, and the broad volcanic plateaus of the Project Vicinity support a homogenous mix of plant species dominated by a few conifer species, as identified above. Variety in species dominance and size is primarily a function of increases in elevation. The Project Vicinity straddles the ecotone between the High and Western Cascades and therefore supports a more xeric plant assemblage and greater diversity than may be found in higher elevation and/or more northerly portions of the High Cascades.

Special Status Species

Surveys conducted in 2000 within significant portions of the Project Vicinity identified over 170 species of plants (PacifiCorp, 2003). No special status plant species were identified at that time. Surveys conducted in June, August, October, November, and December 2014, as reported in the Initial Study Report: Special Status Plants and Noxious Weeds (Pacific Crest Consulting, LLC, 2015), identified over 200 vascular plant species and twelve non-vascular species, three of which were undescribed species of hypogeous fungi (i.e., truffles). No federally- or Oregon-listed threatened, endangered, candidate, or special concern species were found in the survey area.

Eight special status plant species were identified and are indicated below in Table 38 along with their special status listing source and category.

Table 38. Special Status Plant Species Found in the Special Status Plant Species Study Area (Pacific Crest Consulting, LLC, 2015)

Species	Total # of Sites	# of Sites on RRSNF Land	# of Sites on PacifiCorp Land	Status			NRCS Species Code[18]
				S/M [19]	RFSSSL [20]	ORBIC [21]	
Chaenotheca ferruginea	1	--	1	B	--	--	CHFE7
Clavariadelphus sachalinensis	1	--	1	B	--	3	CLSA9
Leptogium rivale	1	1	--	E	--	--	LERI2
Rhizopogon masoniae	1	1	--	--	STR	1-X	RHMA14
Rhizopogon truncatus	1	1	--	D	--	4	RHTR4
Sparassis crispa	1	1	--	D	--	--	SPCR4
Spathularia flavida	3	1	2	B	--	--	SPFL4
Tremiscus helvelloides	1	--	1	D	--	--	TRHE7

The Special Status Species sites located during the Study, with the exception of the one site of *Leptogium rivale* (S/M Category E), were found on forested slopes away from Project facilities and structures by at least thirty meters distance. One of these populations, a site of *Spathularia flavida* (S/M Category B status) was found on a roadcut alongside an old, abandoned road that was likely established for the purpose of constructing the penstock and/or logging the forested slope many years ago. Another population, the one site of *Tremiscus helvelloides* (S/M Category B status), was found in close proximity to, but not on, a very similar abandoned road on the same

[18] Code acronyms retrieved from NRCS *PLANTS Database* (NRCS 2015), accessed January 12, 2015

[19] 2009 Survey and Manage Category

[20] Regional Forester's Strategic and Sensitive Species List as of the most recent update (December 2011). STR = Strategic, SEN = Sensitive

[21] Oregon Biodiversity Information Center: 1 = taxa that are threatened with extinction or presumed to be extinct throughout their entire range (1-X designating presumed extirpation from Oregon or extinction); 2 = taxa that are threatened with extirpation or presumed to be extirpated from the state of Oregon; these are often peripheral or disjunct species which are of concern (when considering species diversity within Oregon's borders, they can be very significant when protecting the genetic diversity of a taxon)—ORBIC regards extreme rarity as a significant threat and has included species which are very rare in Oregon on this list; 3 = taxa for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range; 4 = taxa which are of conservation concern but are not currently threatened or endangered; this includes taxa which are very rare but are currently secure, as well as List 4 contains taxa which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered. While these taxa may not currently need the same active management attention as threatened or endangered taxa, they do require continued monitoring.

forested slope. These abandoned roads had not been maintained for many years, had no evidence of recent use, and were becoming overgrown in areas. No sites were found on or alongside roads that were actively maintained and used. The *Leptogium rivale* site was found on bedrock and large boulders in the bed of the South Fork Rogue River downstream of South Fork Dam.

The Special Status Species of greatest significance is *Rhizopogon masoniae*, presumed to be extinct until found during the Study. This species was previously known only from Clackamas County, Oregon, where recent relocation efforts failed to find sporocarps at historic population sites. The identification of this species was verified by Dr. Michael Castellano, a Forest Service Forest Ecology Researcher, and the voucher currently resides at the office of the Forest Service Forestry Sciences Laboratory in Corvallis, Oregon. With the exception of *Clavariadelphus sachalinesis*, the other Special Status Species located during the Study are not typically viewed as rare or sensitive, as evident by their absence on the Regional Forester's Special Status Species List (RFSSSL) and Oregon Biodiversity Information Center (ORBIC) list. *C. sachalinensis* has ORBIC3 status but is locally common in the south Cascades of Oregon.

The undescribed fungi species found during relicensing surveys are not identified on any of the special status lists that concern the Project. Additional information on these species is presented in the Initial Study Report. The two new species of *Rhizopogon* will be described and published using their two respective Project locations as their type localities. When published, the Project location of the new species of *Hymenogaster* will be included with the species description and greatly expand the previous known range of the species. The Project location of the rare species *Gautieria luteotincta* is a range extension from where it was previously known to be endemic in Nevada. All four species are potential future candidates for ORBIC listing and subsequent RFSSSL listing.

Noxious Weeds

A total of 107 site locations of eight target noxious weed species (Table 39) were found within the Noxious Weed Study Area. None of these weed species are on the Oregon Department of Agriculture (ODA) high priority List A. The greatest plant concentration and diversity of noxious weed species was found between the Prospect No. 2 forebay and the Prospect Central substation.

Previous eradication efforts of the noxious weed *Cytisus scoparius* were observed throughout most of the Project, as evidenced by plants that had been sprayed or cut. Multiple populations had apparently been effectively eradicated, as evidenced by no observed living material; these populations were not documented in the study report. The vegetative biomass of many other populations had apparently been eradicated by these treatments, but seed stock and/or regenerating root masses had given rise to young, small individuals that appeared to have grown post-treatment; the majority of these populations exhibited only a small fraction of what dead original biomass was still present.

Multiple small populations of noxious weeds were hand-pulled by contractor personnel prior to fruiting. These included selected populations of *Centaurea solstitialis*, *Centaurea pratensis*, and *Cytisus scoparius*. These populations were nonetheless reported as part of the study report, due to the fact that previous seed stock could still exist and perpetuate the populations.

Two noxious weed species that did not require documentation during this Study, *Hypericum perforatum* and *Cirsium vulgare*, were casually observed during the course of field surveys. *H. perforatum* was found to be present throughout areas with high light exposure to the ground, such as the transmission line right-of-way, penstocks, roads, openings in forest, and more. *C. vulgare* was present as scattered populations throughout the Project in habitats similar to those of *H. perforatum* and both were often found growing together. *C. vulgare* preferred areas with moisture, such as underneath leaks in the wooden penstocks.

Table 39. Noxious Weed Sites Found in the Noxious Weed Study Area (Pacific Crest Consulting, LLC, 2015)

Species	Number of Sites	ODA Status	NRCS Species Code[22]
Centaurea pratensis	1		CEPR2
Centaurea solstitialis	4	B	CESO3
Cirsium arvense	6	B	CIAR4
Cytisus scoparius	63	B	CYSC4
Lathyrus latifolia	15	B	LALA4
Phalaris arundinacea	2		PHAR4
Rubus armeniacus	9	B	RUAR9
Taeniatherum caput-medusae	7	B	TACA8

E.6.5.2 Project Effects

The special status species sites found on forested slopes, including those mentioned above associated with abandoned roads, do not appear to be affected by any current or proposed Project-related activities. The proposed routes of the new flowline and sag-pipe segments do not come within close proximity to any special status species sites. Any staging areas or other proposed disturbances relating to construction of the new flowline should be done with consideration to special status species site locations. Possible mitigation could include constructing these features at a buffered distance from special status species populations, ensuring no related disturbances within a certain radius from population edges. The Forest Service typically buffers populations at either a 75 foot or 100 foot radius. Multiple special status species site locations were found between the proposed flowline and Imnaha Road. Any proposed roads and associated disturbances for accessing the proposed flowline from Imnaha Road should also be constructed outside the buffer radii. Two of the special status species site locations were found on the bench in close proximity to Imnaha Road; a third site (a *S. flavida*) was also found on the bench but in closer proximity to the slope between the bench and the

[22] Code acronyms retrieved from NRCS *PLANTS Database* (NRCS 2015), accessed January 12, 2015.

proposed flowline. Any erosion control remediation prescribed to the slope below this *S. flavida* site should be done outside of the buffer radius of the population edges. No special status species sites were found near the primary proposed staging area for flowline construction at the north end of the flowline junction with the canal at the end of the spur road on PacifiCorp property approximately 1,000 feet east of Imnaha Road. Construction and related disturbances of this staging area should have no effect on any of the known special status species site locations.

Other potential future activities that may affect the special status species locations are forest management actions and/or reinstituting use of the aforementioned abandoned roads. Forest management activities such as logging or fuels reduction could nonetheless potentially be conducted with minimal or no negative effects on special status species sites if the sites are buffered from such activities. Typical buffers involve a variable radius (often 100 feet) from population edges, within which little to no management activity occurs. Light vegetation removal, such as fuels reduction, could potentially occur within this buffer during the correct time of year when the associated special status species population is not producing sporocarps and the slash is subsequently removed to be burnt or otherwise disposed of outside of the buffer. Reinstituting the use of abandoned roads could affect the above-mentioned sites of *T. helvelloides* and *S. flavida*. Neither population exists in the actual roadway. Damage to the *S. flavida* population could therefore be minimized or perhaps avoided altogether by not disturbing the road cut that the population exists on. The *T. helvelloides*, not being in the roadway or road cut, should not be affected by road use as long as the current roadway is not widened to include the slope the population exists on.

The *Leptogium rivale* site appears robust and healthy. Since the Project operates in run-of-river mode, mostly natural flow levels go through the population area. Operation as normal may therefore have no effect on this population.

The vast majority of noxious weed sites in the Project exist at least partially in areas that are likely affected by Project activities. These areas include existing roads, penstock routes, and other Project facilities. Ground disturbance, caused by activities such as road use, construction, and maintenance within the Project, facilitates dispersal of and establishes suitable habitat for noxious weeds.

Noxious weed management within projects such as Prospect No. 3 would likely be difficult. This is due to the Project bordering a diversity of lands with various ownerships and uses such as agriculture, logging, and private residency. These land uses, plus the presence of public roads within the Project, especially State Highway 62, provide high-potential, regular noxious weed introduction vectors. In addition, the Project overall is generally very narrow in outline, allowing for potentially very fast infestation of noxious weeds across the width of the Project.

Though no ODA List A high priority noxious weed species were detected during the Study, there were multiple specific noxious weed populations found that have potential to quickly become large infestations. These include small populations of *Centaurea solstitialis* and *C. pratensis*. These species are new invaders to the Project, having not been documented previously, and are

relatively small in size. The populations were few in number, found in close proximity to habitats ideal for rapid population expansion, and were growing along roads and waterways that could provide excellent means of dispersal.

The four sites of Other Species of Interest were found on forested slopes away from Project facilities and structures by at least 50 meters distance. One of these sites, the *Hysterangium sp. nov.*, was found directly on an old, abandoned road, likely established to facilitate penstock construction and/or historical logging of the surrounding now mid-seral stand. The two sites of *Rhizopogon sp. nov.* were found in old-growth forest that had historically been lightly thinned; both sites were found in close proximity to old, abandoned roads. These roads were likely being established for the purposes of the aforementioned historical thinning and/or construction of South Fork Dam and associated facilities. The abandoned roads associated with these three sites had not been maintained for many years, had no evidence of recent use, and were becoming overgrown in areas. No sites were found on or along roads that were actively maintained and currently used. The site of *Gautieria luteotincta* was not found on or in close proximity to any abandoned roads.

The four Other Species of Interest are not currently on any list of target species associated with the Study and are therefore not subject to the same protections or mitigations required by programs or protocols associated with those lists. They are however potential candidates for future listing. Protection of these sites may also be desirable for other reasons such as supporting the protection of regional biodiversity.

The four sites of Other Species of Interest do not appear to be affected by any current Project-related activities. The proposed alignments for the flowline and sag-pipe replacements do not come within close proximity to any sites of Other Species of Interest. Any staging areas or other proposed disturbances relating to construction of the new flowline and sag-pipe should be done with consideration to these site locations.

Other potential future activities that may affect the Other Species of Interest locations are forest management actions and/or reinstituting use of the aforementioned abandoned roads. Forest management activities such as logging or fuels reduction could nonetheless potentially be conducted with minimal or no negative effects on sites of Other Species of Interest if the sites are buffered from such activities. Typical buffers involve a variable radius (often 100 feet) from population edges, within which little to no management activity occurs. Light vegetation removal, such as fuels reduction, could potentially occur within this buffer during the correct time of year when the associated Other Species of Interest population is not producing sporocarps and the slash is subsequently removed to be burnt or otherwise disposed of outside of the buffer.

E.6.5.3 Proposed Environmental Measures

PacifiCorp proposes to prepare and implement a Vegetation Management Plan (VMP) for the protection and/or mitigation of sensitive botanical species. The VMP would establish 100-foot buffer zones around known occurrences of special status and heretofore undescribed species.

Ground-disturbing activities and vegetation management would generally be prohibited within the buffer zones. Light vegetation removal, such as fuels reduction, could potentially occur within the buffer zones during the time of year when the associated special status species population is not producing sporocarps. Any proposed actions within buffer zones on Forest Service lands would be coordinated with the High Cascades Ranger District botanist. Slash within buffer zones would be removed to be burnt or otherwise disposed of outside of the buffer. The VMP would also establish requirements for noxious weed treatment prior to ground-disturbing and vegetation management activities and re-seeding and/or re-vegetating disturbed areas following ground-disturbing and vegetation management activities. PacifiCorp's estimated costs for implementation of the VMP are $3,000 per year. The VMP is presented in Volume III, Appendix C of the license application.

E.6.5.4 Unavoidable Adverse Impacts

Operations and maintenance of the Project requires roads and facilities that are cleared of vegetation. In particular, the transmission line right-of-way must be cleared of vegetation that may interfere with the safe operation of the lines adjacent to and below the conductors. Commission dam safety requirements require regular visual inspection of project facilities, including the waterway, which may necessitate vegetation removal. These impacts are typically short-term, minor, and site-specific based on Project needs. Project access interface with public roads (Forest Service, State of Oregon, and Jackson County) and private joint-access roads on actively managed timber lands facilitates the spread of noxious weeds on PacifiCorp property. The spread of noxious weeds may have long-term, cumulative effects.

E.6.5.5 Cumulative Effects

Road construction, road maintenance, timber harvest, and logging have been the dominant anthropogenic forces in the analysis watersheds since the 1940s. These activities remove native vegetation, decrease species and structural diversity, and facilitate the spread of noxious weeds through soil exposure, canopy reduction, and seed dispersal via vehicle vectors. The Project increases the spatial extent of cleared and/or actively managed vegetation within the analysis watersheds. However, as seen in the aerial photograph presented in Figure 11, Project generation facilities support a more natural vegetation regime than the adjacent managed timber lands. Over eighty percent of the analysis watersheds are federally-owned and administered by RR-SNF and CLNP. Lands within the existing Project boundary represent less than one-tenth of one percent (0.0009) of the analysis watersheds, and therefore, Project impacts are proportionally insignificant to cumulative effects at the scale of the analysis watersheds. It is unlikely that construction or the continued operation and maintenance of the Project under past and proposed license terms significantly impact the botanical resources of the analysis watersheds.

E.6.6 Wetland, Riparian, and Littoral Habitat Resources

E.6.6.1 Affected Environment

Riparian areas are adjacent to perennial, intermittent, or ephemeral surface waters (e.g. lakes, rivers, and streams), while wetlands may be influenced exclusively by non-surface (i.e. groundwater) hydrology. GIS data sets from FWS' National Wetlands Inventory (NWI) (U.S. Fish and Wildlife Service, 2012) were used to analyze known wetland and riparian habitats. Five NWI general wetland types were identified in the Project Vicinity: freshwater emergent (102 ac.), freshwater forested/shrub (271 ac.), freshwater pond (12 ac.), lake (24 ac.), and riverine (62 ac.). These general wetland types exhibited three predominant Cowardin classifications (Cowardin, et al., 1979): palustrine, emergent, seasonally flooded (PEMC); palustrine, forested, seasonally flooded (PFOC); and palustrine, scrub-shrub, seasonally flooded (PSSC). Mapped wetlands in the Project Vicinity are primarily associated with stream channels. The most extensive wetland complexes are exhibited by low gradient streams on the plateau between Red Blanket Creek and the North Fork Rogue. In particular, Red Blanket Creek, Ash Creek, and Barr Creek exhibit broad seasonally flooded floodplains that support extensive wetland vegetation. North Fork Reservoir also exhibits a variety of wetland types for approximately 0.5 miles upstream of North Fork diversion dam. High-gradient, v-shaped, stream channels in the Project Vicinity support only limited fringing and in-channel wetlands due to the rocky substrate and high velocity flows.

The Project Area within the FERC boundary intersects six mapped wetland complexes. Only one of these wetlands, the South Fork impoundment, is associated with Project generation facilities. The impoundment upstream of the South Fork diversion dam is identified as a freshwater pond. Project water diversions do not negatively affect this wetland, and the diversion dam increases the inundation zone at the confluence of Imnaha Creek and the South Fork Rogue, thereby increasing overall wetland extent. Temporary wetland impacts have been permitted (U.S. Army Corps of Engineers Permit No. NWP-2009-594; Department of State Lands Permit No. 43623-RP) during past maintenance actions to provide access to the impoundment for dredging operations. The wetland has been monitored for restoration of wetland vegetation and functions, and the site has proven to be resilient to temporary impacts. Native recruitment and restoration of wetland plants occurs within the first three years following impacts.

The remaining five wetlands intersect the transmission line Right of Way (ROW). A single transmission structure is located within the mapped wetland immediately north of Highway 62, but overhead transmission conductors span the other identified wetlands. Wetland impacts are not anticipated within the transmission line ROW during the proposed license term. ROW maintenance actions would be reviewed by PacifiCorp environmental compliance staff to ensure that wetlands are avoided when possible and that required federal and state permits are obtained when necessary.

Bats, waterfowl, passerines, amphibians, aquatic snakes, and their predators utilize wetland habitats within the Project Vicinity. Northern river otter (*Lontra canadensis*), American mink (*Mustela vison*), and American beaver (*Castor canadensis*) are common mammalian wetland

species identified as occurring with the Project Vicinity (PacifiCorp, 2003). Common wetland plant species include alders (*Alnus* spp.), sedges (*Carex* spp.), red-osier dogwood (*Cornus sericea*), field horsetail (*Equisetum arvense*), cow parsnip (*Hieracium albiflorum*), rushes (*Juncus* spp.), monkeyflower (*Mimulus guttatus*), Pacific ninebark (*Physocarpus capitatus*), willows (*Salix* spp.), bulrush (*Scirpus* spp.), Douglas' spirea (*Spirea douglasii*), and cattail (*Typha latifolia*). There are no known invasive wildlife associated exclusively or primarily with wetland habitats in the Project Vicinity, but reed canarygrass (*Phalaris arundinacea*), an invasive plant species associated with wetland and riparian habitats, was observed in the vicinity of Red Blanket Creek during botanical surveys in 2014 (Pacific Crest Consulting, LLC, 2015).

There are approximately 126 miles of mapped stream channels within the Project Vicinity. Riparian habitat is found along all of the major streams that cross the Project boundary, including (from east to west): Imnaha Creek, South Fork Rogue River, Daniel Creek, Middle Fork Rogue River, Red Blanket Creek, Barr Creek, Mill Creek, North Fork Rogue River, and several unnamed tributaries. Many of the streams and rivers in the vicinity exhibit high-gradient, rocky, and constrained channels that limit the hydrologic influence on vegetation to areas immediately adjacent to open water. The exceptions to this rule are the low-gradient, broad floodplains found on the plateau between Red Blanket Creek and the North Fork Rogue.

For the purposes of establishing a baseline of riparian habitat availability, streams adjacent to mapped NWI polygons and/or within known low-gradient reaches were considered to support an average riparian habitat width of 50 feet from each bank. High-gradient reaches were considered to support an average riparian habitat width of 15 feet from each bank. The estimated total riparian habitat within the Project Vicinity is approximately 763 acres, of which 12.21 acres occur within the Project Area.

E.6.6.2 Project Effects

Routine operations and maintenance of the proposed Project would not result in impacts to wetland, riparian, or littoral habitats. Non-routine maintenance, including hazard tree removal or vegetation removal for impoundment dredging access, may impact these habitats. Removal of vegetation within wetland and riparian habitats is generally a temporary impact that may be mitigated by native recruitment of vegetation within three years, as evidenced by monitoring efforts adjacent to South Fork impoundment.

Leakage from the woodstave flowline and siphon has resulted in establishment and growth of potentially jurisdictional wetlands. Some maintenance of these facilities under the no action alternative and replacement of these facilities under the proposed Project alternatives may result in impacts to these wetlands. Jurisdictional delineations would be required prior to project initiation to determine potential permitting and mitigation requirements.

E.6.6.3 Proposed Environmental Measures

PacifiCorp will comply with federal and state wetland regulations regarding the removal and/or fill of sediments from jurisdictional waters, including wetlands, through application for permit authorizations via the U.S. Army Corps of Engineers' Clean Water Act Section 404 process and the Oregon Department of State Lands' Removal-Fill Law (ORS 196.795-990).

On non-federal lands, PacifiCorp will comply with Jackson County riparian ordinances (Chapter 8, Section 8.6), which prohibit removal of riparian vegetation within a fifty-foot setback from top of bank without a landscape plan approved by Oregon Department of Fish and Wildlife.

E.6.6.4 Unavoidable Adverse Impacts

There are no known or reasonably anticipated unavoidable adverse impacts to wetland, riparian, or littoral habitats from the no action or proposed Project alternatives. Any unanticipated impacts to these habitats may be mitigated through federal and state compensatory mitigation programs.

E.6.7 Threatened and Endangered Species

E.6.7.1 Affected Environment

The following sections discuss the recovery, management, and designated critical habitat for the wildlife and botanical species identified as listed, or proposed to be listed as, endangered, threatened, candidate, or species of concern under the federal ESA and/or by the Oregon Fish and Wildlife Commission under the Oregon Endangered Species Act and with the potential to occur in the Project Vicinity. Scoping Document 2 also identified Oregon spotted frog (*Rana pretiosa*) and Western pond turtle (*Actinemys marmorata*) as species that may be affected by the Project (FERC, 2013). Effects of Project operation on Forest Service and State of Oregon rare and sensitive species (e.g., NFP Survey and Manage species) are discussed in Section E.6.4 (Wildlife Resources).

Wildlife

Oregon spotted frog (Rana pretiosa)

The Oregon spotted frog was listed by FWS as threatened on August 28, 2014, and a proposed rule for designation of critical habitat for the species was published in the Federal Register on August 29, 2013. This frog is also listed as sensitive-critical under Oregon's Sensitive Species Rule (OAR 635-100-040) (Oregon Department of Fish and Wildlife, 2008). Oregon spotted frogs are found in or near perennial bodies of water with consistent water regimes and shallow zones exhibiting emergent or floating vegetation. The Project is not located within proposed critical habitat, and there are no known populations of Oregon spotted frogs within the Rogue River Basin (U.S. Fish and Wildlife Service, 2016).

Western pond turtle (Actinemys marmorata)

With the publication of 90-day review findings in the Federal Register on April 10, 2015 (FR Doc. 2015-07837), FWS is performing a status review of the western pond turtle to determine whether listing is warranted. Western pond turtles are listed as sensitive-critical under Oregon's Sensitive Species Rule (OAR 635-100-040) (Oregon Department of Fish and Wildlife, 2008). Despite their name, these turtles are primarily found in rocky streams, large rivers, slow-moving sloughs, and quiet waters (Bury, 1986). Western pond turtles may travel over one mile over land to locate remaining water sources when streams and rivers dry up in late summer (Ibid.). Female western pond turtles select dry, compacted, south-facing, terrestrial slopes for nesting outside of the riparian zone (Rathburn, Siepel, & Holland, 1992). Due to their secretive and wily nature, this species may be difficult to find. Western pond turtles have been observed within the boundary of the adjacent Prospect Nos. 1, 2, and 4 Hydroelectric Project (PacifiCorp, 2003), but no turtles were observed within the Project boundary or surveyed reaches of the South Fork Rogue River, which were surveyed by mask-and-snorkel for fish habitat and demography.

Mountain quail (Oreortyx pictus)

Mountain quail were petitioned for listing in 2000, but following a 90-day finding in 2003, FWS concluded that listing was not warranted. The quail are currently listed as a federal species of concern. Mountain quail typically occupy dense, brushy slopes within mixed conifer forests. The species does well in brushy thickets resulting from fires or clear-cuts, as found in the Project vicinity (U.S. Fish and Wildlife Service, 2016). Mountain quail were observed during focused wildlife surveys of the Project (PacifiCorp, 2015) and the adjacent Prospect Nos. 1, 2, and 4 Hydroelectric Project (Albertelli, 2012).

Northern Spotted Owl (Strix occidentalis caurina)

The northern spotted owl (NSO) was listed as threatened on June 26, 1990. A revised recovery plan was finalized on July 1, 2011 (76 CFR 38575), and a final rule for revised critical habitat was published in the Federal Register on December 4, 2012 (77 CFR 71875) (U.S. Fish and Wildlife Service, 2013). FWS is currently conducting a status review of NSO and the validity of a petition to elevate the listing status to endangered (U.S. Fish and Wildlife Service, 2015). NSOs are found within mature or old growth forests that contain the structures and characteristics required for nesting, roosting, and foraging (NRF). NRF habitat generally consists of moderate to high canopy closure (60 to 90 percent); a multilayered, multi-species canopy with large overstory trees (with diameter at breast-height (dbh) of greater than 30 inches); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly (U.S. Fish and Wildlife Service, 2011). Dispersal habitat, at a minimum, consists of forest stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities.

The Recovery Plan identifies the most important threats to NSO as competition with barred owls, ongoing loss of spotted owl habitat because of timber harvest, habitat loss or degradation from wildfire and other disturbances, and loss of amount and distribution of habitat because of past activities and disturbances. The recovery strategy includes completion of a range-wide habitat modeling tool; habitat conservation and forest restoration; barred owl management; and research and monitoring (U.S. Fish and Wildlife Service, 2011).

Relying on the recovery criteria and best available science established in the Recovery Plan, FWS designated over 9.5 million acres in 11 units and 60 subunits as critical habitat (CH) (U.S. Fish and Wildlife Service, 2012). There is no designated CH within the Project Area. However, subunit 4 of the Klamath East (KLE) CH unit is located approximately 400 feet to the southeast of the southeast extent of the existing Project boundary upstream of South Fork diversion dam. Special management considerations or protection are required in this subunit to address threats to the essential physical or biological features from current and past timber harvest, losses due to wildfire and the effects on vegetation from fire exclusion, and competition with barred owls. This subunit is expected to function primarily for east-west connectivity between subunits and critical habitat units, but also for demographic support.

The final rule determined a set of primary constituent elements (PCEs) based on the current knowledge of the life history, biology, and ecology of the northern spotted owl and the requirements of the habitat to sustain its essential life-history functions. They are as follows:

1. Forest types that may be in early-, mid-, or late-seral stages and that support the northern spotted owl across its geographical range
2. Habitat that provides for nesting and roosting.
    a. Sufficient foraging habitat to meet the home range needs of territorial pairs of northern spotted owls throughout the year.
    b. Stands for nesting and roosting that are generally characterized by:
        i. Moderate to high canopy cover (60 to over 80 percent),
        ii. Multilayered, multispecies canopies with large (20- 30 in (51-76 cm) or greater dbh) overstory trees,
        iii. High basal area (greater than 240 ft^2/acre (55 m^2/ha)),
        iv. High diversity of different diameters of trees,
        v. High incidence of large live trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and other evidence of decadence),
        vi. Large snags and large accumulations of fallen trees and other woody debris on the ground, and
        vii. Sufficient open space below the canopy for northern spotted owls to fly.
3. Habitat that provides for foraging, which varies widely across the northern spotted owl‘s range, in accordance with ecological conditions and disturbance regimes that influence vegetation structure and prey species distributions.
    a. West Cascades/Coast Ranges of Oregon and Washington

i. Stands of nesting and roosting habitat; additionally, owls may use younger forests with some structural characteristics (legacy features) of old forests, hardwood forest patches, and edges between old forest and hardwoods;
ii. Moderate to high canopy cover (60 to over 80 percent);
iii. A diversity of tree diameters and heights;
iv. Increasing density of trees greater than or equal to 31 in (80 cm) dbh increases foraging habitat quality (especially above 12 trees per ac (30 trees per ha));
v. Increasing density of trees 20 to 31 in (51 to 80 cm) dbh increases foraging habitat quality (especially above 24 trees per ac (60 trees per ha));
vi. Increasing snag basal area, snag volume (the product of snag diameter, height, estimated top diameter, and including a taper function),and density of snags greater than 20 in (50 cm) dbh all contribute to increasing foraging habitat quality, especially above 4 snags per ac (10 snags per ha);
vii. Large accumulations of fallen trees and other woody debris on the ground; and
viii. Sufficient open space below the canopy for northern spotted owls to fly.

4. Habitat to support the transience and colonization phases of dispersal, which in all cases would optimally be composed of NRF habitat (PCEs 2 or 3), but which may also be composed of other forest types that occur between larger blocks of NRF habitat.
    a. Habitat supporting the transience phase of dispersal, which includes:
        i. Stands with adequate tree size and canopy closure to provide protection from avian predators and minimal foraging opportunities; in general this may include, but is not limited to, trees with at least 11 in (28 cm) dbh and a minimum 40 percent canopy cover; and
        ii. Younger and less diverse forest stands than foraging habitat, such as even-aged, pole-sized stands, if such stands contain some roosting structures and foraging habitat to allow for temporary resting and feeding during the transience phase.
    b. Habitat supporting the colonization phase of dispersal, which is generally equivalent to NRF habitat as described in PCEs 2 and 3, but may be smaller in area than that needed to support nesting pairs.

The Project is located partially within and immediately adjacent to a study area for long-term demographic studies of NSO populations conducted by the Oregon Cooperative Fish and Wildlife Research Unit (OCFWRU) at Oregon State University (OSU) (Oregon State University, 2013) pursuant to the NFP effectiveness monitoring plan (Lint, Noon, Forsmann, Raphael, Collopy, & Starkey, 1999). Demographic field studies were conducted within the Study Area in Spring 2014, 2015, and 2016. The owl calling stations associated with the demographic study provided survey coverage of the Study Area, and results of the study were shared with Forest Service and PacifiCorp to inform analysis of potential Project impacts on northern spotted owl. Forest Service district wildlife biologist Sheila Colyer also performed NSO habitat typing within the Study Area using FWS protocols on November 6 and 10, 2014 and March 9 and 30, 2015.

Three currently unoccupied, historical NSO activity centers were identified within or adjacent to the Study Area[23]. Two historical nests are approximately 0.47 and 0.98 miles southeast and south, respectively, of the southeastern extent of the existing Project boundary upstream of South Fork Diversion Dam. The third historical nest is approximately 0.59 miles east of the Project boundary (approximately 0.77 miles east of the penstock) on the south-facing slope of the Middle Fork Rogue canyon. This third nest was located on private timber land, which has since been subjected to clear-cutting of the timber within this tract.

The 1.2-mile radius home ranges for each of these nests combined overlap and encompass the entire Study Area. The three 0.5-mile radius core areas of these nests do not overlap the Study Area with the exception of an approximately 0.52-acre area at the southeast corner of the Study Area, upstream of the South Fork diversion dam and outside of the influence of the Project. None of the 300-meter radius nest patches are within the Study Area.

The NSO habitat types defined by criteria in the 2011 NSO Recovery Plan (USDI Fish and Wildlife Service) and identified within the Study Area are described below and depicted in Figure 12. Aerial imagery is presented for comparison in Figure 13.

Nesting, roosting, and foraging (NRF) habitat (9 acres)—NRF habitat was identified on Forest Service property north of the South Fork Diversion Dam. This area had large remnant trees and suitable overstory structure for potential nesting use. Several areas of large downed wood and large snags were available for prey habitat, and adequate flying space for foraging was present.

Dispersal habitat (250 acres)—Eighty-seven percent of the habitat within the Study Area is defined as dispersal habitat. These areas have over forty percent canopy cover, limited potential for nesting structures, and the potential to develop into NRF habitat over time. Dispersal habitat ranges from South Fork Diversion Dam on Forest Service property to the north end of the Study Area near Daniel Creek, existing along either side of the Project waterway.

Capable habitat (24 acres)—Capable habitat exists in the Study Area as a contiguous strip of habitat adjacent to the canal portion of the waterway and in the area north of the powerhouse. This habitat exhibits limited overstory structure, relatively no downed wood, and predominance of shrub or riparian hardwood species. The canal, flowline, and sag-pipe alignments were included in acres defined as capable because the total area is relatively small (<1 acre) and vegetation is able to grow underneath and directly adjacent to these structures.

Non-habitat (3 acres)—Areas of non-habitat were defined as Project structures and impoundments within the Study Area. Although these areas do not meet the High Cascade Ranger District's five acre minimum threshold for habitat typing criteria, the identified structures are permanent and do not exhibit potential for developing into NSO habitat in the future if they remain.

[23] Figure omitted due to privileged information not for public review.

Figure 12. Northern spotted owl (NSO) habitat type within the Study Area

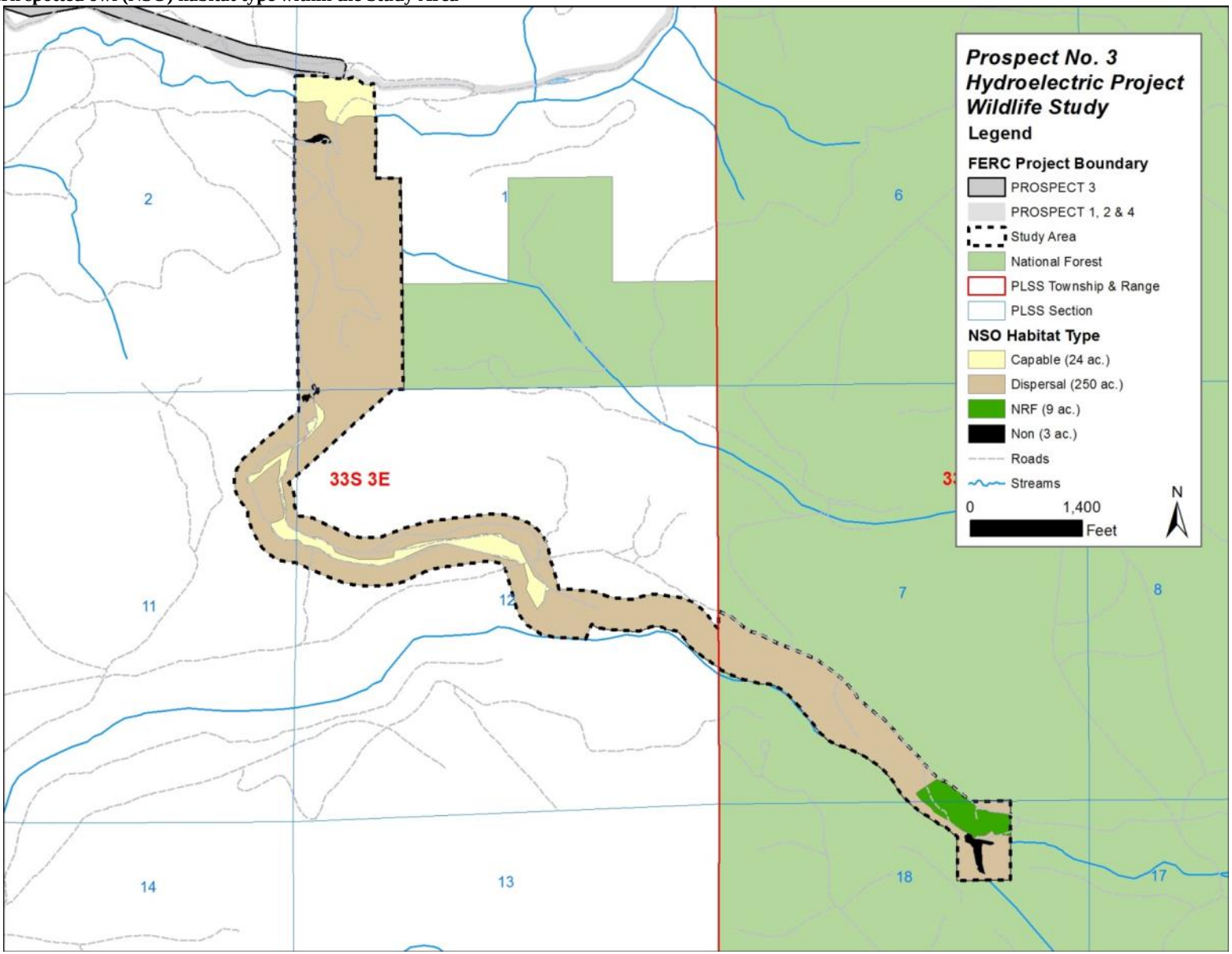
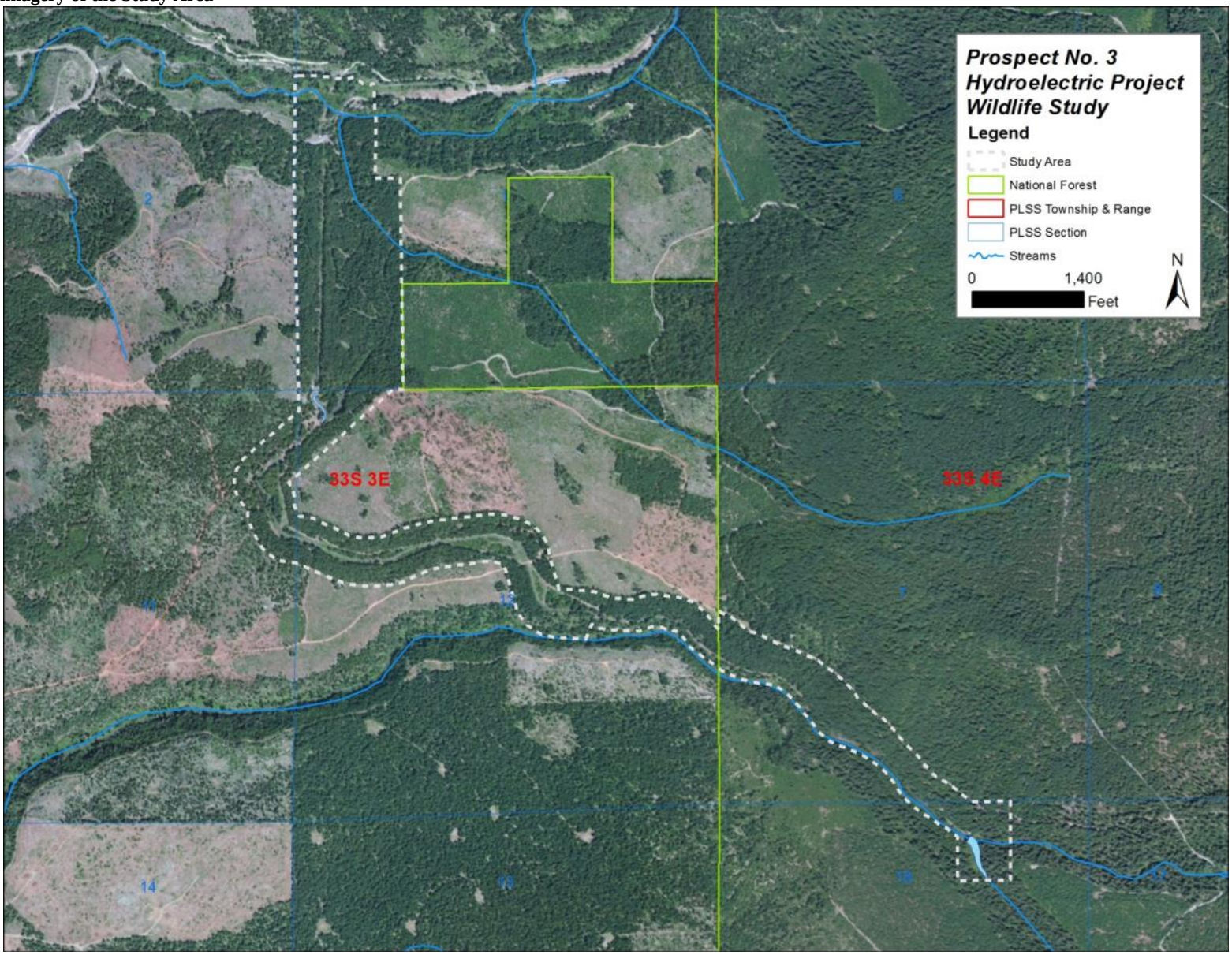


Figure 13. Aerial imagery of the Study Area



Gray wolf (Canis lupus)

Currently the distinct population segment (DPS) of gray wolves west of Oregon Highway 78 and US Interstate 395 are federally-listed as endangered and managed under the federal laws that regulate the harassment or take of wolves. The Rocky Mountains DPS that occurs in eastern Oregon was de-listed by the federal government (U.S. Fish and Wildlife Service, 2011), and on November 10, 2015, wolves were removed from the Oregon Endangered Species list. There is no designated critical habitat or FWS recovery plan for gray wolves in Oregon. Oregon has developed its own Wolf Conservation and Management Plan to meet the requirements associated with state-listed species and the Oregon Wildlife Policy; however, federal laws preempt this plan as long as the gray wolf remains federally listed (Oregon Department of Fish and Wildlife, 2015).

Gray wolves are habitat generalists and will establish territories based on prey availability and conflict with other nearby wolf packs. Wolves are opportunistic carnivores that prefer large ungulates but will eat smaller mammals, birds, fish, or insects when necessary (Oregon Department of Fish and Wildlife, 2015).

As of July 2015, there are sixteen wolf packs and at least thirteen breeding pairs in Oregon (Oregon Department of Fish and Wildlife, 2015). The Rogue wolf pack, consisting of a breeding pair and three offspring, and the Keno pair of wolves are the only known wolves west of the Cascade crest. The area of known wolf activity for the Rogue Pack overlaps the Project Area. The Rogue wolf pack's breeding male paired with a female and produced three pups in 2014. The breeding male is collared with a GPS-radio collar, and GPS location data indicates that the pack area of use is approximately 355 square miles (Oregon Department of Fish and Wildlife, 2015).

Canada lynx (Lynx canadensis)

The Canada lynx was listed as threatened on March 24, 2000 (65 CFR 16053), and revised critical habitat was designated for the species on February 24, 2009 (74 CFR 8616) (U.S. Fish and Wildlife Service, 2013). There is no designated Canada lynx critical habitat in Oregon. A recovery plan outline was finalized in 2005, and there are no core, secondary, or peripheral recovery areas within the Project Vicinity (U.S. Fish and Wildlife Service, 2005). Lynx inhabit boreal and sub-alpine forests that receive deep snow and support high-density populations of snowshoe hares, the principle prey of lynx. The Project Vicinity does not exhibit these habitat features and is unlikely to support populations of Canada lynx.

Fisher (Pekania pennanti)

On April 14, 2016, the FWS issued its finding that the West Coast Distinct Population Segment (DPS) of fisher is not eligible for listing under the Endangered Species Act (U.S. Fish and Wildlife Service, 2016). The state of Oregon lists the fisher as a sensitive species in the critical

category. Since the species is not a federal- or state-listed endangered or threatened species, no further analysis is provided in this section.

Red tree vole (Arborimus longicaudus)

On October 13, 2011, FWS concluded that the North Oregon Coast DPS of red tree vole warranted listing, but doing so at that time was precluded by higher listing priority actions (U.S. Fish and Wildlife Service, 2016). Consistent with this decision, FWS designated the North Oregon Coast DPS as a candidate for listing. Red tree voles are listed as sensitive-critical within the Coast Range Ecoregion under Oregon's Sensitive Species Rule (OAR 635-100-040) (Oregon Department of Fish and Wildlife, 2008). The Project is located outside of the North Oregon Coast DPS and Coast Range Ecoregion identified by FWS and ODFW, respectively.

Red tree voles are found primarily in late-successional, coniferous forests west of the crest of the Cascade Mountains. They principally feed on Douglas-fir needles and nest in Douglas-fir trees. Red tree voles are unlikely to persist in younger forest stands due to their strong preference for older trees and complex forested habitats (U.S. Fish and Wildlife Service, 2016). These small rodents have limited home ranges and dispersal distances often of less than one acre (Ibid).

An unconfirmed red tree vole nest, which did not appear to be in active use, was observed during wildlife transect surveys (PacifiCorp, 2015). Nest material consisted of conifer cuttings of a size (5 to 20 cm) and diameter (<0.5 cm) indicative of red tree vole nests (Huff, Van Norman, Hughes, Davis, & Mellen-McLean, 2012). However, the nest material was decomposing and diagnostic resin ducts were not observed on the ground below the nest. The sensitive species Study Area is outside of the red tree vole NFP S/M protocol survey zones, which are bounded on the south by the Middle Fork Rogue River. Tree voles are locally common on the High Cascades Ranger District of the RR-SNF (Albertelli, 2013).

Botany

No special status species were observed during focused plant surveys conducted in 2000 within a partially overlapping study area associated with the relicensing process for Prospect Nos. 1, 2, and 4 Hydroelectric Project (FERC No. P- 2630) (PacifiCorp, 2003). There is one federally listed plant species potentially within the Project Vicinity: Gentner's fritillaria (*Fritillaria gentneri*). There are also two state listed species potentially within the Project Vicinity: Umpqua mariposa-lily (*Calochortus umpquaensis*) and Wayside aster (*Eucephalus vialis*). However, because these two species are administratively protected only within the state of Oregon, there is no designated critical habitat or recovery/management plans. Wayne Rolle, RR-SNF Forest Botanist, confirmed that these three federally- or state-listed species do not occur on the High Cascades District of the RR-SNF (Rolle, 2013) and these species were not observed during focused surveys. These listed threatened and endangered species are discussed below in additional detail.

Umpqua mariposa-lily (Calochortus umpquaensis)

Because this species is largely restricted to serpentine-derived soils in the Umpqua River basin and isolated serpentine substrates in Josephine and Jackson Counties, it is unlikely that it occurs within the Project Vicinity. There are no known biological opinions, status reports, or recovery plans for this species, but a Conservation Agreement between BLM, Forest Service, and FWS signed in 1996 reduces logging threats to populations on public land (Oregon Department of Agriculture, 2013).

Wayside aster (Eucephalus vialis)

This species occurs in a wide range of habitat types and is often found in relatively open areas of dry, mixed-coniferous forest. While most populations occur at elevations from 490 to 1,480 feet, the species has been found up to 6,680 feet. An interagency Conservation Assessment was updated by Forest Service and BLM in 2005, and a Conservation Agreement between BLM, Forest Service, and FWS was developed in 2006 (Oregon Department of Agriculture, 2013). The Conservation Agreement does not identify any known sites within the Project vicinity or on the High Cascades Ranger District of the RR-SNF (Bureau of Land Management, U.S. Forest Service, and U.S. Fish and Wildlife Service, 2006). It is unlikely that wayside aster occurs within the Project Vicinity.

Gentner's fritillaria (Fritillaria gentneri)

Fritillaria gentneri was federally listed as endangered on December 10, 1999, and a recovery plan for the species was finalized on July 21, 2003 (U.S. Fish and Wildlife Service, 2003). Critical habitat has not yet been designated for this species. It occurs in a wide variety of habitats and soil types, but is often found in grassland and chaparral habitats within, or on the edge of, open woodlands. The recovery plan identifies four recovery units based on overlapping, 15-kilometer buffers of known population centers. The distribution of this species is highly localized, and no individuals are known to occur beyond a distance of 15 kilometers of any of the 11 identified population centers (U.S. Fish and Wildlife Service, 2003). Furthermore, the species is not known to occur outside of a 30-mile radius of the Jacksonville Cemetery in Jacksonville, Oregon. While the Project Area is outside of the identified recovery units, the southwestern portion of the Project Vicinity overlaps the extreme northeast boundary of Recovery Unit 3. Therefore, it is possible, though unlikely, that Gentner’s fritillaria occurs within the Project Vicinity but outside of the sphere of influence of the Project.

E.6.7.2 Project Effects

Wildlife

Oregon spotted frog (Rana pretiosa)

The Project is not located within proposed critical habitat, and there are no known populations of Oregon spotted frogs within the Rogue River Basin (U.S. Fish and Wildlife Service, 2016). Therefore, the no action alternative and proposed Project would have no effect on Oregon spotted frog or its designated critical habitat.

Western pond turtle (Actinemys marmorata)

Western pond turtles have been observed in the boundary of the adjacent and overlapping Prospect Nos. 1, 2, and 4 Hydroelectric Project (PacifiCorp, 2003), and it is possible that they exist within the current and proposed Project boundary. The species is adapted to inconsistent flow regimes experienced in the Mediterranean climate of Southern Oregon and Northern California (Bury, 1986), and it is unlikely that Project water diversions would have significant negative impacts on potential pond turtle habitat in the South Fork Rogue River downstream of the diversion dam. Maintenance activities may exert short-term, intermittent potential to disturb nesting habitat on south facing slopes near riparian areas during nesting, incubation, and neonatal overwintering. In consideration of these minor, short-term, intermittent potential impacts, the no action alternative and proposed Project would have no effect on western pond turtles.

Mountain quail (Oreortyx pictus)

Mountain quail typically occupy dense, brushy slopes within mixed conifer forests. The species does well in brushy thickets resulting from fires or clear-cuts, as found in the Project vicinity (U.S. Fish and Wildlife Service, 2016). Mountain quail were observed during focused wildlife surveys of the Project (PacifiCorp, 2015) and the adjacent Prospect Nos. 1, 2, and 4 Hydroelectric Project (Albertelli, 2012). This species is locally common within the Project area. It is unlikely that Project operations and maintenance would negatively impact mountain quail in the no action or proposed Project alternatives. Vegetation management and/or hazard tree removal may have short-term benefits for mountain quail as native recruitment from early successional species leads to the establishment of brushy thickets. The no action and proposed Project alternatives may affect but is not likely to adversely affect mountain quail.

Northern Spotted Owl (Strix occidentalis caurina)

No NSOs were observed in the Project Vicinity during focused surveys in 2015 or long-term demographic surveys in 2014, 2015, and 2016. There is no designated critical habitat within the existing or proposed Project boundary. It is possible that NSOs utilize CH and non-CH within the Project Vicinity for NRF and dispersal. There are no planned operations and maintenance

activities under the no action or proposed Project alternatives that would impact the NRF habitat to the north of the diversion dam. Unplanned, emergency removal of hazard trees on the slope above Project facilities at the diversion dam or on adjacent access roads may necessitate impacts of limited scope that would not impact NRF habitat elements at the stand-scale.

The no action and proposed Project alternatives may result in impacts to 250 acres of identified dispersal habitat within the sensitive species study area. However, anticipated levels of vegetation management treatment would be significantly lower in practice and are more appropriately measured by the number of trees removed than by acres. The acres of potential treatment and management are provided for cumulative, programmatic analysis over the proposed Project term. The Project may impact dispersal habitat through reduction of canopy cover and removal of individual pole-sized trees. Reduction of canopy cover would be localized and would not reduce the cover below 40% at the stand scale. The limited temporal and spatial scope of vegetation management measures suggests that these actions are not likely to adversely affect dispersal habitat.

Under the proposed Project alternative, replacement of the flowline would necessitate removal of approximately 0.40 acres of dispersal habitat for establishment of a construction staging area. These 0.40 represent less than one percent (0.0016) of the identified 250 acres of dispersal habitat within the sensitive species study area. Clearing for the construction staging area would not completely bifurcate the dispersal corridor; dispersal habitat would remain on the slope between the flowline and the South Fork Rogue.

Overall, potential impacts of the proposed Project actions are minor when viewed at a 500-acre scale of analysis, offered in the critical habitat final rule as one of many possible project-specific scales to be selected based on relevancy "to the northern spotted owl life-history functions supplied by the PCEs and affected by the project" (U.S. Fish and Wildlife Service, 2012). None of the proposed Project actions would remove or degrade PCEs at the stand scale. Project actions have the potential to reduce canopy cover and remove large trees with various deformities, snags, fallen trees, and woody debris through treatment and maintenance. These impacts are primarily the result of facility maintenance, and in general, these impacts would occur within 150 feet of edge habitat bordering manmade structures. Potential impacts are associated with discrete projects and locations associated with the Project, and these impacts would be measurable at a scale of the number of trees and not the number of acres treated. Continued and proposed operation and maintenance of the Project would not impact any designated CH and would not result in significant impacts to identified NRF or dispersal habitat, and therefore, the Project may affect, but is not likely to adversely affect NSO.

Gray wolf (Canis lupus)

The Rogue wolf pack utilizes a large home range of approximately 355 square miles, of which the Study Area (286 acres or 0.44 square miles) would only be a small portion. The Project may indirectly impact the species through impacts to its preferred prey, but there is no indication that gray wolves primary prey species, including deer and elk, are significantly impacted by the Project. Deer and elk accounted for a regular and significant portion of all wildlife observations

during wildlife transect surveys (PacifiCorp, 2015). It is assumed that Project would have no effect on gray wolves.

Canada lynx (Lynx canadensis)

Lynx inhabit boreal and sub-alpine forests that receive deep snow and support high-density populations of snowshoe hares, and the Project does not exhibit these habitat features. The Project would have no effect on Canada lynx or their designated critical habitat.

Red tree vole (Arborimus longicaudus)

Red tree voles are found primarily in late-successional, coniferous forests west of the crest of the Cascade Mountains and are unlikely to persist in younger forest stands due to their strong preference for older trees and complex forested habitats (U.S. Fish and Wildlife Service, 2016). Impacts of limited scope may be compounded for red tree voles due to their small home ranges and limited dispersal capabilities. Red tree voles may be impacted through removal of hazard trees and vegetation management along Project waterways. Under the proposed Project alternative, removal of 0.40 acres of mixed coniferous forest for clearing of a flowline construction staging area may potentially impact red tree voles and/or their habitat. Despite these potential impacts, red tree voles are locally common, and the Project is located outside of the North Oregon Coast DPS and Coast Range Ecoregion identified by FWS and ODFW, respectively, for listing of the species. Therefore, the Project may affect, but is not likely to adversely affect, red tree voles or their habitat.

Botany

Umpqua mariposa-lily (Calochortus umpquaensis)

Because this species is largely restricted to serpentine-derived soils in the Umpqua River basin and isolated serpentine substrates in Josephine and Jackson Counties, it is unlikely that it occurs within the Project Vicinity. The Project would have no effect on Umpqua mariposa-lily.

Wayside aster (Eucephalus vialis)

The Conservation Agreement for wayside aster does not identify any known sites within the Project vicinity or on the High Cascades Ranger District of the RR-SNF (Bureau of Land Management, U.S. Forest Service, and U.S. Fish and Wildlife Service, 2006). It is unlikely that wayside aster occurs within the Project Vicinity, but if the species colonized areas outside of its currently known range, it is possible that Project operations or maintenance could impact the species. The Project may affect, but is unlikely to adversely affect the species.

Gentner's fritillaria (Fritillaria gentneri)

Fritillaria gentneri occurs in a wide variety of habitats and soil types, but is often found in grassland and chaparral habitats within, or on the edge of, open woodlands as found on the Project. The distribution of this species is highly localized, and no individuals are known to occur beyond a distance of 15 kilometers of any of the 11 identified population centers (U.S. Fish and Wildlife Service, 2003). It is possible, though unlikely, that Gentner's fritillaria occurs within the Project, and if the species colonized areas outside of its currently known range, it is possible that Project operations or maintenance could impact the species. Therefore, the Project may affect, but is unlikely to adversely affect the species.

E.6.7.3 Proposed Environmental Measures

PacifiCorp does not propose any PM&E measures specific to potential impacts of the proposed Project to federal- or state-listed endangered, threatened, or candidate species or species of concern. Upgrades to and additional construction of wildlife crossings would benefit terrestrial wildlife species by providing improved habitat connectivity across Project waterways.

E.6.7.4 Unavoidable Adverse Impacts

Project operations at the canal intake and fish screens, forebay and penstock intake, and powerhouse would continue to contribute to above-ambient noise levels that may result in minor, long-term, site-specific unavoidable adverse impacts to localized dispersal, demography, and habitat selection of wildlife.

Project vegetation management, including the removal of hazard trees and clearing of waterway alignments, may impact wildlife through the removal and/or degradation of habitat elements.

E.6.8 Recreation and Land Use Resources

E.6.8.1 Affected Environment

License Article 408 required PacifiCorp to monitor recreation activity in the Project Area for a period of five years and file a recreation report, prepared in consultation with the Oregon Parks and Recreation Division (OPRD) and Forest Service, with the Commission within six years of license issuance. The initial recreation monitoring report was filed with the Commission on January 23, 1995 and approved by Commission order on March 6, 1995. This order required PacifiCorp to continue recreation monitoring and to file a recreation monitoring report no later than January 31 of every sixth year. A second recreation monitoring report was filed with the Commission on January 31, 2001. Both recreation monitoring reports identified less than 200 total visitors over each five-year period. With the support and concurrence of OPRD and Forest Service, PacifiCorp requested to be relieved from future monitoring given the limited recreational use, potential for development, and demand in the area. The Commission concurred

with PacifiCorp's request, approved the 2001 report, and deleted Article 408 from the license by Commission order on April 3, 2001. Furthermore, on March 3, 2010 the Commission exempted PacifiCorp from filing Form 80 recreation reports for the Project.

There are no shoreline buffer zones, shoreline management plans, or developed recreation facilities associated with the Project.

In general, recreation use and demand at the Project is low compared to the nearby North Fork Rogue River, Joseph H. Stewart State Recreation Area, and Crater Lake National Park. Recreational opportunities are limited on private lands, including those owned by PacifiCorp, in the Project Area. Hunting is the primary recreational use in the Project Area and Vicinity. Rogue River-Siskiyou National Forest (RR-SNF) lands within the Project Area are subject to various recreational uses including hunting, fishing, camping, hiking, bird watching, and picnicking. The South Fork Rogue River Trail (RR-SNF Trail No. 988) is adjacent to the Project Area and traverses the bluff above the Project impoundment at the confluence of Imnaha Creek and the South Fork Rogue. Trail No. 988 is accessible from Forest Road 3775690 to the east of the Project.

The current Oregon Statewide Comprehensive Outdoor Recreation Plan (SCORP) was published in July 2013 and is effective through 2017 (Oregon Parks and Recreation Department, 2013). The SCORP identifies a number of important demographic and social changes facing outdoor recreation providers in the coming years including continued population growth, a rapidly aging Oregon population, fewer Oregon youth learning outdoor skills, an increasingly diverse Oregon population and increasing levels of physical inactivity. These issues are described in detail and key planning recommendations are made on a programmatic and regional basis. Results and key findings identified in the SCORP that have relevance to the Project are listed below:

- Walking and/or hiking is the top outdoor recreation activity engaged in across all age groups and ethnic groups in terms of both participation rate and intensity.
- Camping in tents was the preferred youth program activity across all youth age categories.

The SCORP planning effort also included a state- and county-level analysis to identify priority Projects for the distribution of Local Government Grant Program funds for both close-to-home areas (located within an urban growth boundary (UGB) or unincorporated community boundary) and dispersed areas (located outside of these boundaries) (Oregon Parks and Recreation Department, 2013). Dispersed area needs identified for Jackson County include RV/trailer campgrounds and facilities, acquisition of natural open space, and picnicking/day-use facilities. The Project Area exhibits low potential for contributing to the satisfaction of these needs. The county-level data was also combined to identify statewide need. Statewide, dispersed area needs include group campgrounds and facilities, RV/trailer campgrounds and facilities, public restroom facilities, tent campgrounds and facilities, group day-use facilities, and acquisition of trail corridors and rights-of-way.

The Project is not located within or adjacent to any designated National Wild and Scenic River System or Oregon State Scenic Waterway segments or river segments under study for inclusion as such. However, within the Project Vicinity, the North Fork Rogue River is designated as both a National Wild and Scenic River (National Wild and Scenic Rivers System, 2013) and Oregon State Scenic Waterway (Oregon Parks and Recreation Department, 2013) from the boundary of Crater Lake National Park to the RR-SNF boundary near Prospect. There are no Project lands designated or under study for inclusion as features of the National Trails System or Wilderness Area.

Regionally important recreation areas in the Project Vicinity include the RR-SNF, the North Fork Rogue River, North Fork Reservoir, and Lost Creek Lake. Beyond the Project Vicinity, but within ten miles of the Project, are a number of regionally and nationally important recreation areas including Crater Lake National Park, the Pacific Crest Trail, and Sky Lakes Wilderness. Non-recreational land uses within and/or adjacent to the Project area include hydropower production, aquatic and terrestrial habitat, open space and timber production.

Whitewater Boating

American Whitewater has identified a 6.75-mile segment of the South Fork Rogue from Butte Falls-Prospect Highway (approximately 3.75 miles downstream of the dam) to Lost Creek Lake as a whitewater boating opportunity for kayakers (American Whitewater, 2011). This river segment is a portion of the Project bypass reach and is subject to variations in flow and ramping because of Project operations. PacifiCorp maintains a water right for diversion of up to 150 cfs from the South Fork Rogue for hydropower generation.

The South Fork Rogue is not well known as a whitewater boating opportunity. Two well-regarded Oregon whitewater boating guide books, *Soggy Sneakers* (Giordano, 2004) and *Paddling Oregon* (Keller, 1998) do not contain any descriptions of the South Fork Rogue. However, a link provided on the American Whitewater website (Gandesbery, 2007) reports that the South Fork Rogue exhibited relatively low quality, high challenge Class IV-V opportunities for kayakers. Gandesbery described the run as shallow and “boney” (i.e. rocky) at lower flows and dangerous at higher flows due to frequent logs and infrequent eddies. This description is supported by PacifiCorp’s 1986 (Campbell-Craven Environmental Consultants) and 2014 (Siskiyou Research Group, 2015) habitat surveys in the South Fork Rogue River bypass reach. In 1986, surveyors encountered nine cataracts, or vertical bedrock drops, ranging in height from four feet to ten feet. As a result, a large number of portages are to be expected on this reach. Gandesbery suggests that boating opportunities are optimized at flows of 250 cfs and higher.

In coordination with Bill Cross, Regional Coordinator for American Whitewater, PacifiCorp queried the local boating community via the “Waterdogs” email distribution list. A single boater, Jared Sandeen, responded to the request for information and provided answers to written interview questions (Sandeen, 2013). Sandeen confirmed that use of the South Fork Rogue is predominantly limited to local boaters and estimated use levels of 10 to 20 user days per year. Sandeen personally boats the South Fork approximately three times per year, flows permitting. Contrary to Gandesbery’s earlier report, Sandeen reports that the run is free of log blockages,

which may be the result of above average flow years since 2007. Sandeen concurs that the run is difficult, Class V whitewater, but he notes that the South Fork is desirable for its steep drops, runnable waterfalls, and scenic gorges. Due to the boating challenges reported by both Gandesbery and Sandeen, it is likely that boater preference for the South Fork is predicated on individual boater skill level and preference for high challenge boating. Sandeen estimates optimal flows for boating the South Fork Rogue at 200 to 300 cfs and notes that adequate flows are rare and difficult to determine.

PacifiCorp emailed a stakeholder and focus group meeting invitation to seventeen potential attendees, including members of American Whitewater and the Southern Oregon Waterdogs boating email distribution list, on May 9, 2014, and invitees were encouraged to forward the invite to any other potential interested parties. PacifiCorp conducted the meeting on Tuesday, May 20, 2014 at 6:30 PM, at the Medford Interagency Office of RR-SNF. The meeting was conducted for the purpose of identifying and surveying stakeholders and focus groups with an interest in whitewater resources affected by the Project. PacifiCorp sought to gain first-hand knowledge of recreation flows, boating access and take-out locations, and potential boating needs within the bypassed reach. The meeting attendees included one local boater, a RR-SNF Recreation Planner, and three PacifiCorp staff members. The local boater confirmed that advanced or expert level skills are required to run the South Fork due to deep canyons and technical passages, and while he had not run the bypassed reach, he was familiar with the limited window of availability for boating the bypassed reach.

A formal whitewater boating survey questionnaire was developed and provided to whitewater boaters to determine the types and locations of whitewater boating activities occurring within the bypassed reach of the South Fork Rogue River and a range of conditions (including flows) generally acceptable to whitewater boaters with various skill levels. The survey included interviews with whitewater boaters who were familiar with the bypassed reach. A total of forty-four whitewater boaters were contacted.

Of the forty-four whitewater boaters initially contacted, only twelve had ever attempted to run the bypassed reach. Ten of these boaters chose to participate in the Whitewater Boating Survey Questionnaire. Participants identified flows of 200 and 350 cfs as the minimum and optimum flows for boating in the bypassed reach. Participant boaters identified the following limiting factors for whitewater boating use in the bypassed reach:

1. the short boating window when minimum boating flows are available under the current flow scenario;
2. optimum boating flows have potential to occur during a very short window of time in an unimpaired flow scenario;
3. the high skill level required to boat the Class IV and V rapids in the bypassed reach;
4. the uncertainty of woody debris in the narrow channel, which can occur at any time during the season;
5. the steep, canyon morphology, which restricts the number of safe and accessible put-in and take-out locations along the bypassed reach;

6. the bypassed reach is primarily bounded by private property, which limits the number of public access points for put-in and take-out; and
7. the nearby availability of highly accessible and equally challenging whitewater boating opportunities on the North Fork Rogue River system.

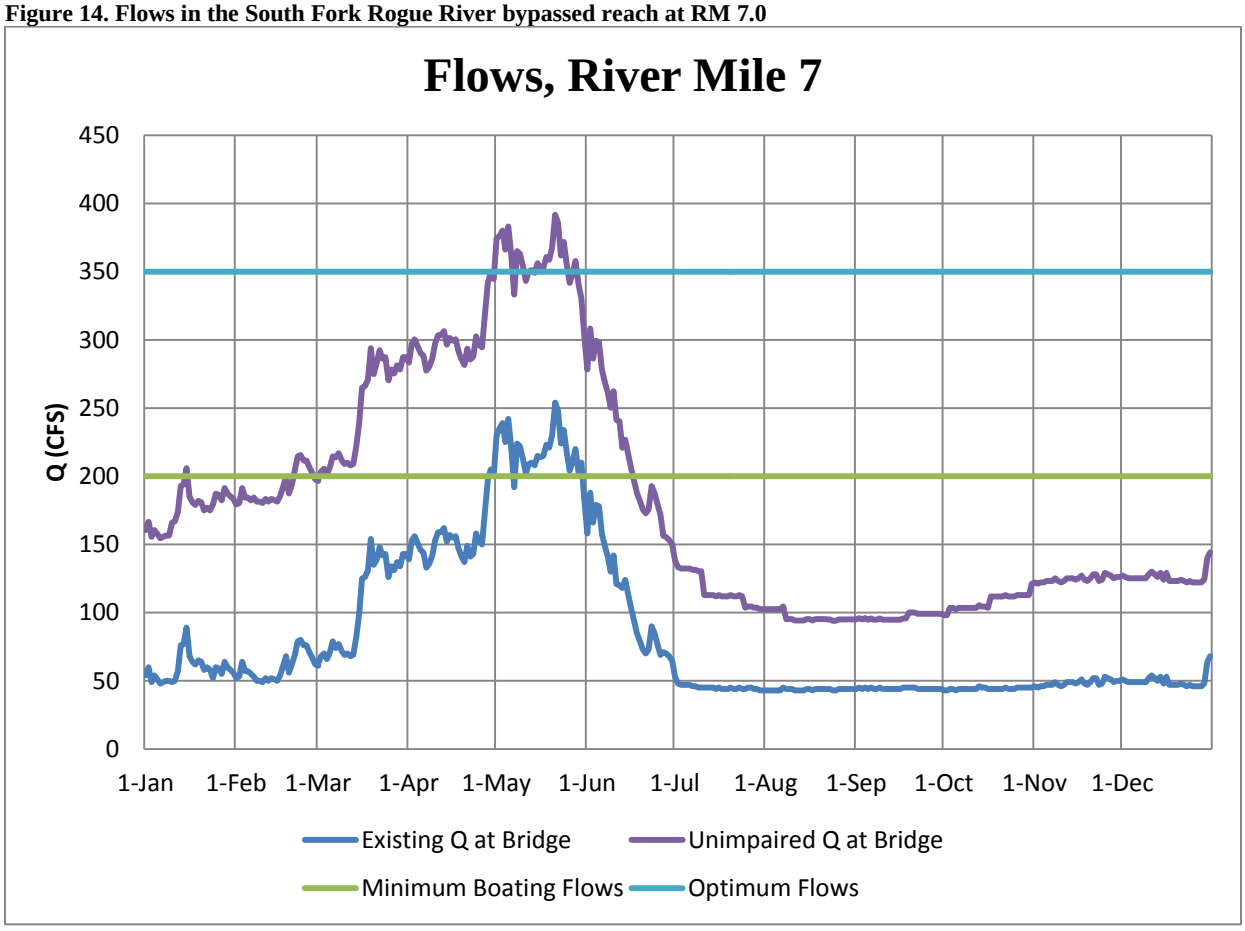
An annual hydrograph of median daily flows in the bypassed reach at the boating put-in location (RM 7.0) was developed for analysis of hydrology available for whitewater boating. This hydrograph utilizes daily average discharge below the dam measured at USGS gaging station 14332000 (RM 10.0) and seasonal groundwater accretions confirmed during in-stream flow studies. Figure 14 approximates the average daily hydrology associated with impaired (current Project condition; "Existing Q at Bridge") and unimpaired ("Unimpaired Q at Bridge") flows at the put-in location at the Butte Falls-Prospect Highway bridge over the South Fork Rogue River (PacifiCorp, 2015). Unimpaired flows are those that would potentially occur if there were no diversion for power generation throughout the year. Using the minimum and optimum boating flows of 200 cfs and 350 cfs, respectively, as identified in the boater survey questionnaire, the minimum and optimum boating window can be determined from Figure 14. Under current operations, the recreational boating season extends from approximately April 29 to May 29 at minimum boating flows. Under an unimpaired flow scenario, the boating season extends from approximately February 21 to June 16 at minimum boating flows and April 29 to May 28 at optimum boating flows.

E.6.8.1 Project Effects

Project effects on recreational flows in the South Fork Rogue River bypassed reach are limited. Because the Project operates in run-of-river mode (i.e., because there is not active water storage in a reservoir above the diversion dam), seasonal flows from upstream springs, rainfall, and snowmelt control the amount of water available to both the Project and bypassed reach. PacifiCorp diverts up to 150 cfs from South Fork Rogue River and releases a minimum of 10 cfs into the bypassed throughout the year under current operations (i.e., the no action alternative). During periods of low seasonal flow (typically July through December) inflows to the Project are, on average, less than the combined water right and minimum in-stream flow (i.e., less than 160 cfs).

Applying the minimum boatable flow criteria of 200 cfs identified by the participant boaters (see E.6.8.1), the window for boatable flows ranges from February 21 through June 16 under the unimpaired flow scenario and April 29 through May 29 under the existing flow scenario (Figure 14). The number of boatable days at the identified minimum boatable flow is 116 days and 31 days for the unimpaired and impaired flow scenarios, respectively. The optimal boatable flow criteria of 350 cfs is only exhibited in the unimpaired flow scenario for thirty-one days from April 29 through May 29, The period and duration of minimum boatable flows in the impaired flow scenario is consistent with the period and duration of optimal boatable flows in the unimpaired scenario.

Figure 14. Flows in the South Fork Rogue River bypassed reach at RM 7.0



Very few boaters have attempted to run the bypassed reach. Those boaters who have demonstrated personal experience with the bypassed reach are highly-skilled whitewater boaters. The high level of technical skill required to float the bypassed reach limits the pool of potential boaters for this reach. Reduction of Project diversions for the purpose of increasing flows in the bypassed reach would provide benefits of a limited duration to a small user group that has access to other whitewater boating opportunities of equal or better quality in the Project vicinity. Future use of the bypassed reach by whitewater boaters is not expected to increase during the term of the proposed Project (thirty to fifty years). Boaters outside of the existing user group are likely willing to forgo the opportunity to boat the bypassed reach in favor of other nearby whitewater boating opportunities.

E.6.8.2 Proposed Environmental Measures

PacifiCorp does not propose any measures for enhancing recreation opportunities at the Project.

E.6.8.3 Unavoidable Adverse Impacts

The no action and proposed Project alternatives result in diversion of 150 cfs from the South Fork Rogue River for power production, which results in a decrease in the window of minimum boatable flows within the South Fork Rogue River bypassed reach from approximately 116 days to approximately 31 days.

E.6.9 Aesthetics and Scenic Resources

E.6.9.1 Affected Environment

The Project is located in a heavily forested area of the High Cascades physiographic province. Local topography has been shaped by regional volcanism and glaciation. The visual character of the area is dominated by mixed-coniferous forest and deep, rocky, river canyons. The aesthetic character has been subject to minor modifications by the development of access roads, trails, parking areas, homes, ranching operations, timber operations, and hydropower development. Photos showing the general visual character and setting of the Project facilities are provided in Appendix C of the PAD.

Hydropower generation facilities associated with the Project are largely restricted from public view. In order to view the concrete diversion dam from below, the public would have to hike the river bottom of the South Fork Rogue canyon from west of the diversion. The impoundment upstream of the diversion and intake structure are visible from RR-SNF Trail No. 988. The diversion, intake facilities and small one-acre impoundment interrupt the aesthetic consistency of the rocky canyon, but the impoundment does provide the effect of a reflecting pool below the trail bluff and increase the extent of emergent wetland vegetation. Members of the public accessing National Forest lands via Forest Road 3775800 (Imnaha Road) cross the hydropower canal, but the visual character of this Project segment exceeds the quality of the surrounding private lands that have been subject to extensive timber harvest. The Project powerhouse is visible from both sides of the Middle Fork Rogue canyon, but available viewpoints are limited to private lands with restricted access.

The most visible Project feature is the transmission line corridor, which runs from the powerhouse through the rural community of Prospect to the Prospect Central substation. Most of the transmission line parallels the Prospect Nos. 1, 2, and 4 Hydropower Project waterways and is located on private land running perpendicular to limited public viewpoints (e.g. road crossings).

The Forest Land and Resource Management Plan (Forest Plan; (USDA Forest Service, 1990)) guides all natural resource management activities and establishes management Standards and Guidelines for portions of the RR-SNF that were previously included in the Rogue River National Forest. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management. The Forest Plan establishes Forest-wide multiple-use goals and objectives and Management Area direction,

including Management Area prescriptions and Standards and Guidelines that apply to future management activities in that Management Area. The Forest Plan considers existing and future special-use permits and requires the RR-SNF to consider public benefits as well as the special-use permit applicant's need by evaluating the relationship of a proposal to other forest uses and objectives. Similarly, the Forest Plan establishes management goals for minerals and energy including provisions for development and production of energy resources on the Forest in coordination with other resource values, environmental considerations, and laws related to energy development.

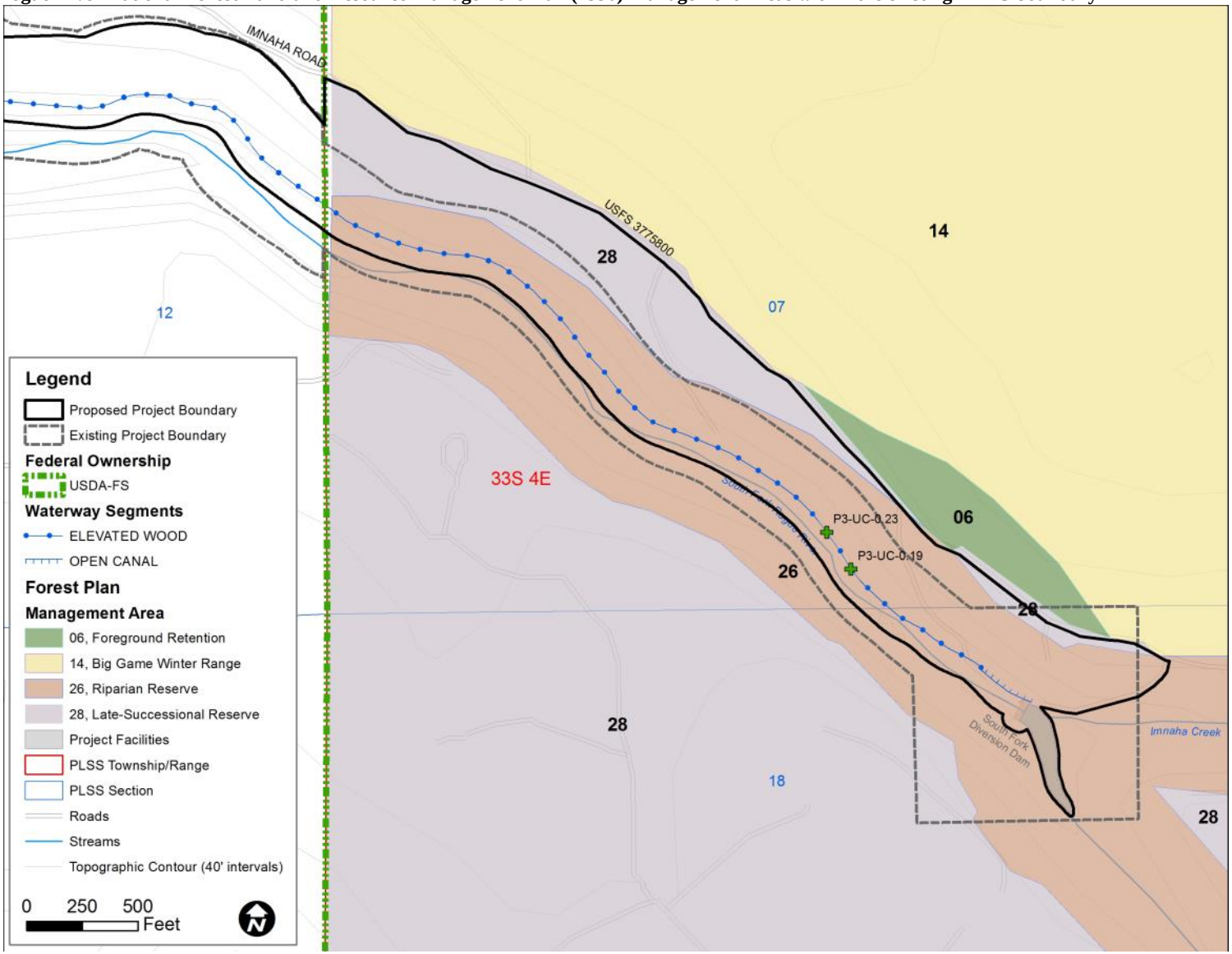
The existing and proposed Project boundaries are primarily within Management Areas for Late-Successional Reserve and Riparian Reserve, with minor inclusions of Big Game Winter Range and Foreground Retention to the north of Forest Road 3775800 (Figure 15). There are no existing or proposed facilities or actions that would impact the Big Game Winter Range and Foreground Retention Management Areas. The visual quality objective (VQO) for Late-Successional Reserve and Riparian Reserve Management Areas is identified as "retention" in the NFP and Forest Plan, respectively. The "retention" VQO from the Visual Management System (USDA Forest Service, 1974) has been replaced by the Scenic Integrity Level of "HIGH" in the superseding document, *Landscape Aesthetics: A Handbook for Scenery Management* (USDA Forest Service, 1995). HIGH scenic integrity refers to landscapes where the valued landscape character "appears" intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident.

E.6.9.2 Project Effects

The small size and scale of Project facilities suggest they present only a minor intrusion to the visual character of the area. All Project facilities including the South Fork Rogue River bypass reach are generally out of public view by both recreation users and motorists. The Project is consistent with existing management designations, plans and objectives governing aesthetic resources.

There are no proposed Project activities that are inconsistent with the goals, standards, or guidelines for management of these areas. Energy development is not prohibited in any of these Management Areas. Removal of individual hazard trees or multiple, adjacent trees for unforeseen Project facility maintenance would not result in appreciable impacts at the scale of individual Management Area units. Allowable deviations from the scenic integrity would repeat the form, line, color, texture, and pattern common to the landscape character so as not to be readily evident at regular rates of travel on the 3775800 road. When felling trees, PacifiCorp should retain large woody material on-site consistent with the proposed Vegetation Management Plan. Areas of vegetation disturbance should be re-seeded or re-vegetated in coordination with RR-SNF staff. Proposals for ground-disturbing activities, including tree felling, would be coordinated through a Notice to Proceed process with RR-SNF, and the Project would be subject to the terms and conditions of a new special-use permit with RR-SNF, which is required to comply with the Forest Plan objectives. For these reasons, the Project would comply with the Forest Plan objectives for visual quality.

Figure 15. Rogue River National Forest Land and Resource Management Plan (1990) Management Areas within the existing FERC boundary



E.6.9.3 Proposed Environmental Measures

PacifiCorp does not propose any measures specific to aesthetic or visual resources. Implementation of the Project VMP would ensure that the Project complies with scenic integrity levels on National Forest lands through minimal vegetation management adjacent to Forest Road 3775800 to retain the appearance of intact forest landscapes.

E.6.9.4 Unavoidable Adverse Impacts

No unavoidable adverse impacts to aesthetic or visual resources were identified during Project scoping or technical studies.

E.6.10 Cultural Resources[24]

E.6.10.1 Affected Environment

A review of the Oregon State Historic Preservation Office (SHPO) cultural resource site database in April 2013 indicated that there are no known historic or archaeological sites that have been determined eligible for or listed on the National Register of Historic Places (NRHP) in the Project Area. Consultation with the Oregon SHPO during the last Federal Energy Regulatory Commission licensing process determined that there were no known National Register-eligible properties in the Project Vicinity at the time the license was issued. By letter dated August 20, 1985, the Oregon State Historic Preservation Officer stated that the Project "…is not of historic significance and since ground disturbance of previously undisturbed ground is minimal . . . there will be no likely impact to cultural resources."

Indian tribes that may attach religious and cultural significance to historic properties within the Project Area or Vicinity are listed below:

- Confederated Tribes of Grande Ronde
- Confederated Tribes of Siletz Indians
- Cow Creek Band of Umpqua Tribe of Indians

PacifiCorp is not currently aware of any historic properties with traditional cultural or religious significance to Indian tribes within the Project Area or Vicinity.

Cultural resource studies have been conducted in the Rogue River drainage since the 1960s in conjunction with a wide range of watershed development activities and to satisfy general site inventory and management goals of federal agencies. Much of the work has consisted of

[24] Locations of archaeological resources, including distances from Project features, have been omitted to preserve the confidentiality of cultural resource information. Authorized parties may obtain additional information in the Updated Study Report.

pedestrian survey in the Cascade Range, as this is where the bulk of federal lands are situated. Excavations have been limited to hydroelectric projects that took place in the 1970s and 1980s (i.e., Davis 1983). There have been few subsurface archaeological investigations in the Project vicinity in general, and very few studies in the last 20 years (although see Connolly et al. 1994; Tveskov and Cohen 2006).

Cultural Context

Pre-contact Context

Paleoindian Period (prior to 10,000 B.P.)

The Paleoindian period is poorly represented in the archaeological record of the Upper Rogue River. In the general region, this period has frequently been associated with distinctive fluted projectile points associated with Clovis cultures. Isolated finds distinctive of this time period have not been identified in the immediate Project vicinity; however, a complete fluted projectile point was purportedly identified at Medco Pond (Butte Falls Clovis) southwest of the Project, although its original location is unverified (LaLande and Fagan 1982). The nearest evidence of Clovis culture comes from single projectile points identified at Site 35DO634, (Seneca Clovis), northwest of the Project, and Site 35JA301 (Ridgeline Clovis), south of the Project (Fagan et al. 1995; Ozbun and Fagan 1996). While these finds are not associated with radiocarbon dates, evidence of Clovis cultures across North America have been tightly dated to between 12,800 and 13,250 calibrated years B.P. (Waters and Stafford 2007).

Fluted projectile point finds from the Northwestern Great Basin in Harney and Lake Counties, Oregon, continue to increase, supporting a strong Paleoindian presence in that region. Recent fluted points identified in Harney County including Sage Hen Gap (35HA3548), Sheep Mountain (35HA3667), and Rim Rock Draw (35HA3855) (O'Grady et al. 2008; Wisner 2012a, 2012b). Recent research has also suggested that large stemmed projectile points may be associated with populations that pre-date Clovis cultures (i.e., Wisner 1998). In particular, research at Paisley Caves in south-central Oregon has identified human coprolites dating to as old as 14,525 calibrated years B.P. and stemmed projectile points associated with radiocarbon dates as old as 13,293–13,519 calibrated years B.P. (Jenkins et al. 2014:486, 498).

Early Archaic Period (10,000 to 6000 B.P.)

In general, this period is characterized by large foliate-shaped and broad stemmed projectile points. Other tools included knives, scraping tools, milling stones, and edge-faceted cobbles (Connolly 1986:118; Pettigrew and Lebow 1987:11.61), indicating people were hunter and gatherers engaged in utilizing large mammals for food and clothing, as well as plants such as nuts and seeds for consumption. Pettigrew and Lebow (1987) refer to this period as the Applegate Phase based on data from archaeological site 35JA53. The Glade Tradition is initiated during the Early Archaic. This is interpreted to be a regional variant of the Cascade Phase, which is found throughout much of the Pacific Northwest during the early to middle Holocene (Connolly 1986, 1991; Leonhardy and Rice 1970). In parts of southwest Oregon and northwest

California, Connolly (1986) and others argue that this tradition is remarkably persistent, and may have been present for much of the Holocene. A wide variety of stone implements are associated with the Glade Tradition: foliate and shouldered, contracting stem projectile points, edge-faceted cobbles, stone bowls, hammer/anvil stones, and fluted unifaces (Connolly 1986:118–119).

The Early Archaic was interrupted by the cataclysmic eruption of Mount Mazama around 7700 B.P. (Bacon and Lanphere 2006), which undoubtedly led to abandonment of the area for some time. There has been no clear evidence of occupation of the Upper Rogue River prior to the eruption, although areas in the Umpqua Basin (35DO383, 35DO672, and 35DO848), the Lower Rogue River (35CU84), and the Applegate Valley (35JA53) have identified pre-Mazama cultural deposits (Brauner and Nisbet 1983; Goebel 2001:22; Musil 1994; O'Neill 1996, 2008; Pettigrew and Lebow 1987:11.61). Excavations at Site 35JA189 (west of the Project) and Site 35JA190 (west of the Project) identified archaeological deposits above Mazama ash (deposited after the eruption). Excavations at these two sites indicate they were utilized as seasonal camps during warmer seasons of the year with the earliest occupation around 6000 B.P. (Connolly et al. 1994:151, 161).

Middle Archaic (6000 to 2000 B.P.)

The Middle Archaic is characterized by large ovate and broad-stemmed projectile points, including Marial and Coquille styles of projectile points (Winthrop 1993:184). Winthrop (1993:196) describes this period as a mobile subsistence and settlement regime that tends to produce seasonal camps and task sites, particularly in regions such as the Project area. Pettigrew and Lebow's (1987) Marial and Coquille Phases fall within the Middle Archaic period. The Marial Phase is dominated by intensive obsidian use, diverging stem broad necked and large willow leaf projectile points, unifaces, end scrapers, and a continuing presence of edge-faceted cobbles. The Coquille Phase is dominated by intensive use of cryptocrystalline silicate (CCS) raw materials, broad-necked Coquille-series and smaller willow leaf projectile points, and a high frequency of end scrapers (Pettigrew and Lebow 1987:11.60–11.61; Winthrop 1993:182). Middle Archaic assemblages often follow the Glade Tradition described above, a technology which includes stemmed and foliate projectile points that exhibit continuities from the Early Archaic (Connolly 1986). An obsidian hydration curve developed for Elk Creek obsidian suggested that a rim measurement larger than 2 microns was indicative of the Middle Archaic period (Pettigrew and Lebow 1987:10.26).

The Middle Archaic archaeological record in the current Project vicinity is more robust than that of the Early Archaic period although archaeological site data is limited to projectile point styles and obsidian hydration data. The Joham II Site 35JA27, located southwest of the Project, contained subsurface projectile points associated with the Coquille series and obsidian hydration rind measurements between 3 and 5 microns (Pettigrew and Lebow 1987; Winthrop 1993:187), although the majority of this site was associated with artifacts from the Late Archaic. Site 35JA102 (west of the Project) contained a subsurface component with projectile points indicative of the Middle Archaic period including broad-stemmed, stemmed pointed shoulder, and notched lanceolate styles (Budy and Elston 1986:135).

Late Archaic (2000 B.P. to Contact)

The Late Archaic period is characterized by narrow-neck small stemmed, basal notched, or triangular projectile points, the appearance of residential features, and fauna and flora remains in the Lost Creek and Elk Creek regions (Pettigrew and Lebow 1987:11.69–11.72). Winthrop (1993:197) describes the Late Archaic as a collector subsistence and settlement regime that tends to produce villages, seasonal camps, and task sites in the region. Further, Winthrop (1993:205) suggests that people would have inhabited "moderate elevations, near perennial fish-bearing streams, and in the low foothills above the valley floors." Pettigrew and Lebow's (1987) Rogue Phase falls within the Late Archaic period. The Rogue Phase is further divided into Rogue 1, typified by Coquille side-notch, Elk Creek square-barbed, and small willow leaf projectile points, and Rogue 2, typified by Rogue River series of projectile points (including barbed, diverging stem, and corner notched) (Pettigrew and Lebow 1987:11.61–11.62).

Elements of the Glade Tradition may persist through much of the Late Archaic in parts of the region (Connolly 1991; see also Beckham and Minor 1992). The Siskiyou Pattern, as defined by Connolly (1991), first appears in sites at approximately 1500 B.P. and is associated with a suite of assemblages of the Shasta and Irongate cultural complexes of northwestern California and southwestern Oregon. This pattern includes narrow-neck and barbed projectile points (i.e., Gunther style), hopper mortars, manos, and metates. In addition, trade items such as *Olivella* shell beads have been identified in other parts of southwest Oregon and northern California (Connolly 1986:120). The Gunther Sphere is based on the Gunther Pattern of northern California and includes fishing gear, pestles, steatite bowls, and ceramics. The Gunther Sphere is interpreted as an archaeological complex that existed at the same time as the Siskiyou Pattern but began somewhat later, around 1000 B.P. (Connolly 1986:119).

Site 35JA23 (Fawn Creek Site), located southwest of the Project, contained deep deposits dating to the last 3,000 years, including occupational/residential floors, food processing features, a human burial, and house pits (Davis 1983:32–41; Joyer 2006). Site 35JA27's Late Archaic component was represented by various artifacts and eight radiocarbon dates, all within the last 2,000 years (Pettigrew and Lebow 1987:10.3). Numerous groundstone tools were identified at the Windom Site (35JA412), southwest of the Project, and projectile point types suggested this locale was utilized for food processing over the last 2,000 years (Tveskov et al. 2002). Unique to this area has been the discovery of pot sherds and clay figurines dating to the Late Archaic period, potentially indicative of a regional pottery tradition present between 1100 and 400 B.P. (Mack 1989:50; Winthrop 1993:181). Pot sherds and figurines were identified at 35JA27 (southwest of the Project), and most recently, an anthropomorphic clay figurine was identified at the Blue Gulch Site (35JA205) located southwest of the Project and interpreted to be a toy (Thorsgard n.d.; Tveskov and Cohen 2006).

Ethnographic Context

The Project is near the territorial historic boundary of the Molala, Takelma, and Klamath. Spier (1930: Figure 1) maps the town of Prospect as being the boundary between the Upland Takelma and Molala. However, Berreman (1937:14) maps the entire Project area as within Upland Takelma territory, postulating that the Molala territory did not extend as far south as the Rogue

River until “recent” times. Kendall (1990:590) depicts the Takelma territory as extending upriver to Elk Creek and Lost Creek, but not as far as the South Fork Rogue River or the town of Prospect (i.e., the Project area). The Klamath territory is mapped as extending to the west side of Crater Lake, between 15 and 20 miles northeast of the Project. The Project’s upland setting was likely utilized for hunting, and gathering berries and roots by numerous peoples; however, these ethnographically documented boundaries were never intended to be a strict line, rather they were meant as a general territorial overview. As such, each of these three groups will be briefly discussed in relation to their documented use of the Cascades.

A wide network of mountain trails allowed all of these groups to utilize the uplands and travel for trade, warfare, or resource gathering (Zenk and Rigsby 1998:440). The Klamath, Takelma, and Molala languages are each part of the Plateau Penutian family (Beckham 1986:32; Kendall 1990:589; Stern 1998:446). The Takelma are closely related in language to their northern neighbors, the Cow Creek. The Upland Takelma spoke a language called Takelman and had a different dialect than the Lowland Takelma. Two dialects of Molala language have been postulated for the Northern and Southern Molala (Zenk and Rigsby 1998:439).

The Southern Molala territory encompassed the headwaters of the North Umpqua, South Umpqua, Upper Rouge, Middle Fork Rouge, and South Fork Rogue Rivers, in the Western Cascades and High Cascades (Zenk and Rigsby 1998:439–440). The Klamath territory was centered around Upper Klamath Lake, though a subgroup (Pelican Bay) inhabited the area around Agency Lake, 20 miles southeast of the Project (Stern 1998:446–447). The Upland Takelma may have once occupied the Upper Rogue River to the summit of the Cascades, bordering Klamath territory. Historically, however, their territory was reduced to areas west of Prospect as the Molala people moved into the area (Berreman 1937:27).

The Southern Molala would winter at bŭ’kstubŭ’ks, a village located near the modern town of Prospect (Spier 1930:4). The Klamath and Molala both frequented Huckleberry Mountain, 8 northeast of the Project, for picking berries in early fall (Spier 1930:9). The Cow Creek, residing primarily on the South Umpqua River, also utilized this upland resource (Beckham 1986:35). Spier (1930:24, 28) notes that as the Klamath and Molala utilized the same upland territory, the two groups maintained friendly relations, unlike the Upland Takelma with whom the Klamath often had turbulent relations, with each group conducting raids on the other. The Takelma also utilized the uplands often camping in Molala territory near the headwaters of the Rogue River (Spier 1930:29).

Klamath and Molala intermarriage was not uncommon and resulted in some bilingualism (Stern 1998:454; Zenk and Rigsby 1998:439–440). The Klamath obtained buckskins from the Molala, offering pond-lily seed and beads in trade (Spier 1930:41). According to Spier’s (1930:59) informants, the Upland Takelma did not practice cranial deformation, unlike the Klamath and Molala (see also Zenk and Rigsby 1998:440). The Molala were known to hunt deer using snares, while the Klamath primarily hunted with bow and arrow; both groups apparently utilized dogs to some extent for tracking and driving game (Spier 1930:158; Stern 1998:449). Deer was the most common animal hunted in the High and Western Cascades although elk was also hunted to a

lesser extent (Stern 1998:449). Yew, available in the Western Cascades, was a preferred wood for bows for most groups (Spier 1930:194).

Euroamerican settlement of the region increased in the 1800s, and increased pressure from explorers and American settlers led to a series of treaties between tribal groups and the U.S. government. By the time these treaties were being negotiated, there were few surviving Molala people. The Molala Treaty of 1855 stated that Molala people would be removed to the Grand Ronde Reservation in western Oregon (Kappler 1904:740–741). Some Southern Molala went to the Klamath Reservation, presumably because of their closer ties to those groups (Zenk and Rigsby 1998:444).

The Klamath Lake Treaty of 1864 granted the Klamath reservation lands that included upper Klamath and Agency Lakes, and the Williamson and Sprague River drainages (Stern 1998:460). In 1954, the Klamath Tribes were terminated from federal recognition as a tribe by an act of Congress (Public Law 588). The Klamath Termination Act also dismantled the Klamath Reservation (Hood 1972). The Klamath Tribes regained federal recognition in 1986.

The Cow Creek signed a treaty in 1853 ceding most of their territory to the U.S. government and reserving land along Cow Creek (Kappler 1904:606). That treaty was canceled when the Rogue River War began following a series of massacres and battles between the settlers and the Indians. That fall, federal authorities signed the "Treaty with the Rogue River" with some of the Takelma and Athapaskan chiefs and established the Table Rock Indian Reservation along the north bank of the Rogue River just north of present-day Medford (Kappler 1904:603; Schwartz 1997:59–60). This reservation was short lived and, after three years of hostilities, many Takelma and Cow Creek were removed to the Grand Ronde and Siletz Reservations (Kendall 1990:592). Many people, however, chose not to move to the reservations and settled in various places in the region. The Cow Creek and Takelma were included in 1954's Public Law 588 that terminated federal services to Western Oregon Tribes. The Cow Creek, however, were able to successfully challenge this law and received federal recognition in 1982.

Historic Context

The first settlers to the region were part of the Applegate party (led by Jesse Applegate) who established the Applegate Trail in 1846. Located 35 miles southwest of the Project APE, the trail extended through the modern Interstate 5 corridor in this part of Oregon, passing near Medford and through the Cascade Mountains east of Ashland (Jackson County Planning Department 1992:13; Most 2003). As more and more land was claimed in the fertile central Rogue River Valley (near Medford), people began seeking out places to claim in the uplands, including Prospect Flat (LaLande 1980a:176).

Chauncey Nye was one of the first Euroamerican settlers in the Project vicinity. He and his family settled just north of the modern town of Prospect (LaLande 1980a:176–177), although Mr. Nye received a land patent for property near Cascade Gorge, approximately 4 miles southwest of Prospect (Bureau of Land Management [BLM] 1882). The General Land Office (GLO) map of 1884 depicts the first developments of the general Project area (BLM 1884). A

house is mapped along a road that appears to have been present in Section 29 of Township 32 South, Range 3 East. The road is mapped as "Wagon Road from Rogue River Valley to Fort Klamath." The wagon road appears to have crossed the Rogue River in the vicinity of the modern North Fork Reservoir. The house is on property purchased by Erick Salstrom under the Cash Entry Act of 1820 (BLM 1891).

There are also three houses mapped on the 1884 GLO as "Aiken's House." One is associated with a mapped barn and saw mill on the section line between Section 29 and Section 30, Township 32 South, Range 3 East. The location with the house, barn, and saw mill is within the modern town of Prospect along Mill Creek (BLM 1884). This sawmill was constructed in 1873 by John Beeson and C. D. Slosson, who sold it a year later to Harvey P. Deskins. In 1883, the sawmill was purchased by brothers Fred and Squire Aiken (LaLande 1980a:177). The sawmill's location was situated 0.5 miles south of Structure 8/3. A portion of the land where the sawmill was located on Mill Creek, was purchased by George Aiken (son of Squire Aiken) under the Cash Entry Act (BLM 1887). The George Aiken parcel was in Section 32. The other portion of the sawmill property was purchased by Charles Millsap in Section 29 (BLM 1892b).

The other two houses mapped as "Aiken's House" on the GLO map are both just west of Red Blanket Creek in what is labelled "Red Blanket Prairie" (BLM 1884). One house is adjacent to an agricultural field in Section 33 and the second is approximately 0.1 miles east in Section 34; both are in Township 32 South, Range 3 East. This property was issued to both Fred Aiken and Squire Aiken, who each purchased numerous 160-acre parcels under the Cash Entry Act (BLM 1889a, 1889b, 1890). One portion of the property was issued to Squire Aiken under the Homestead Act of 1862 (BLM 1892a). In total, the property encompassed 640 acres and was known as "Red Blanket Ranch" (LaLande 1980a:177). Interestingly, the location of "Red Blanket Ranch" is where the G. C. Hollenbeak House is currently located, also adjacent to an agricultural field. The G. C. Hollenbeak House was constructed in 1910 and the family ran a cattle operation (Clay 1979a).

Harvey Deskin was the postmaster for the post office in the area (then called Deskin). Squire Aiken became the next postmaster and, in 1889, he was able to get the town name changed to Prospect (LaLande 1980a:177; McArthur 1992:691). Squire Aiken also opened the first general store in Prospect (Atwood 1979). The post office and general store were destroyed by fire in 1980 (Clay 1979b). The Prospect Hotel was built in 1892 by A. H. Boothby in response to the increasing numbers of people passing through Prospect on their way to Crater Lake (LaLande 1980a:180).

The wagon road depicted on the 1884 GLO was built initially in 1864 to ease travel between Fort Klamath and Jacksonville (BLM 1884; LaLande 1980a:170). This road alignment in the vicinity of Prospect has been variously called Union Creek Military Road, Jacksonville–Fort Klamath Military Wagon Road, and Crater Lake Road (LaLande 1980a:164; Shafer 1989; Tucker 2001). Portions of the road are still visible today (Shafer 1989). A similar alignment to this road later became Crater Lake Highway after a movement to make an accessible and more permanent route to the popular tourist attraction (Bell 2011). The original Crater Lake Highway route was

eventually bypassed when Highway 62 was constructed. Today, a portion of the original Crater Lake Highway alignment is still in use as Mill Creek Drive.

In order to provide better farmland around Prospect, local residents constructed a water delivery system between 1920 and 1921 to aid in irrigation, diverting water from Mill Creek (LaLande 1980a:181). This system became known as Nye Ditch as the ditch was built by Nelson Nye (son of Chauncey) and Clem Clark along with their families and neighbors. Purportedly, there were two portions of the ditch. The upper portion was located north of Prospect and was used until the 1950s. The lower portion was 6.5 miles long extending between Prospect and Cascade Gorge, and is still used by area residents (Nye Ditch Users Improvement District 2014; Shafer 1989).

The high quality of timber in the Project vicinity was well known and with lumber demand increasing in the early twentieth century, the Project area was a draw for timber companies (LaLande 1980a:182). The Skeeters brothers leased a sawmill in 1940 approximately 0.8 miles northeast of Structure 16/3. This camp housed approximately 30 loggers and their families until 1973 when the mill was shut down and all of the buildings were torn down (Shafer 1986:4).

As settlement increased, so did concerns about natural resources in the west. The Forest Reserve Act of 1891 protected certain areas from homesteading or settlement in order to preserve the environment; these areas were administered by the Department of the Interior (Williams 2000:8). The Cascade Range Forest Reserve was established in 1893 by presidential proclamation in order to protect the crest of the Cascade Mountain Range and places such as Crater Lake, Diamond Lake, Mount Thielsen, Three Sisters, Mount Jefferson, and headwaters of most of the major rivers of the state (Unrau and Mark 1987; Williams 2000:25). Forest Reserves were eventually administered by the Department of Agriculture and they became National Forests. The Siskiyou National Forest was created in 1906, and the Crater Lake National Forest was created in 1908. The Crater Lake National Forest became the Rogue River National Forest in 1932, and in 2004, it was combined with the Siskiyou National Forest. Today, the combined National Forests consist of a 1.8-million-acre area, and a portion of the Project APE is within the High Cascades Ranger District (Forest Service 2015).

PacifiCorp Background

In the 1850s, brothers Dr. Charles R. Ray and Col. Frank H. Ray established the Braden Mine and Mill on Gold Hill, in what is now the town of Gold Hill in Jackson County, Oregon. Encouraged by technological advances in hydroelectric power production and frustrated by the cost and limitations of steam power, the Rays incorporated the Condor Water & Power Company and sold bonds to cover the cost of hydroelectric development on the Rogue River. By 1902, they had completed construction of a hydroelectric facility called Gold Ray, 4 miles east of Gold Hill. In 1907, Condor Water and Power reorganized as Rogue River Electric (Dierdorff 1971).

Production was substantially augmented in 1911 with completion of the Prospect Hydroelectric Plant (now Prospect No. 1 Powerhouse) on the Rogue River. The water-conveyance system, Powerhouse, and transmission line from Prospect to the Gold Ray plant were completed in 1911. Prospect not only powered the Ray brothers' milling operation but also provided electricity to the communities of Medford, Jacksonville, Central Point, Grants Pass, and Ashland, Oregon (Perrin

and Miller 2013:Appendix A:7). In 1913, Rogue River Electric merged with Northern California's Siskiyou Light and Power, creating California Oregon Power Company (COPCO), which purchased the Rays' interest in the Prospect plant (*Medford Mail Tribune* 1925:5). By 1921, COPCO was conducting preliminary studies as to how to increase the capacity of the Prospect Development. In 1926, COPCO initiated construction of a greatly expanded Rogue River hydroelectric development that incorporated the original 1911 Prospect facilities. Byllesby Engineering & Management Corporation assumed responsibility for the design and construction of the new facilities, which included the North Fork Diversion Dam and pond; 7,000 ft of canal; a forebay; 3,100 ft of wood-stave flowline; a surge tank; penstocks; and the Prospect No. 2 Powerhouse. This system comprised Phase I of the so-called North Fork Development, which went into service in January 1928.

Expansion of the existing Prospect facilities and construction of Prospect No. 2 were only the first steps in expanding hydroelectric power production on the Rogue River. Drawings dated October 5, 1921, indicate initial interest in a canal line stretching from the Middle Fork to the North Fork of the Rogue River (COPCO 1921). By September 1924, survey crews were actively exploring the area around the Middle and South Forks in anticipation of further expansion for what was being called the South Fork Development, also known as Prospect No. 3 (Partridge and Hackett 1925). Simultaneously, preliminary geological reports were conducted for regulation, diversion, pondage, and storage projects being considered for further expansion of Prospect No. 2 (COPCO 1925). Of the projects considered, only the diversion project, encompassing the South Fork Development and subsequently Prospect No. 3, was constructed.

From June 20, 1925 to August 6, 1925, COPCO conducted extensive survey work on the Middle Fork of the Rogue River. A road was constructed to branch off from the main road between Prospect and Butte Falls to approximately 0.5 miles below (downstream from) a gaging station, as reported by COPCO engineer E. C. Koppen in a 1925 report. Koppen further noted that "in connection with the investigations at Prospect, gaging [sic] stations were established on the Middle Fork and on Mill and Red Blanket Creeks. . . . The station on the South Fork was established previous to 1925. The gaging stations are visited and maintained by the Company employees at Prospect" (Koppen 1925).

By 1926, construction of the North Fork Dam, Prospect No. 2 Powerhouse, and associated water-conveyance system was well underway. In January 1928, the North Fork Development was complete, and the Prospect No. 2 Powerhouse went into service. During and following construction of the North Fork Development, continued studies were made to "determine the relationship between the several streams or parts of streams that are or ultimately will be tributary to the Prospect No. 2 Plant or the proposed Regulation Project" (Koppen 1929). Concurrently, further surveys for the "Prospect 3-A Development" were being conducted; Prospect 3-A appears to have been a hybrid of what had previously been referred to as Prospect No. 3, the South Fork Development, and/or the Diversion Project. Maps depicting 1926 survey results for Prospect 3-A show both an upper and lower location for dam sites on the Middle Fork, as well as three possible powerhouse and penstock locations for the South Fork (COPCO 1928). In 1961, COPCO merged with Pacific Power and Light, predecessor of PacifiCorp.

The so-called Prospect Diversion Project No. 2001, as constructed, included three diversion dams located on the Middle and South Forks of the Rogue River and Red Blanket Creek. The diversion project also included miles of flumes, canals, and siphons. Since initial construction of the Project almost 80 years ago, numerous changes due to maintenance concerns and technological improvements have occurred. Today, the Prospect No. 3 Hydroelectric Project, incorporating the South Fork Diversion Dam, Prospect No. 3 Powerhouse, and associated penstocks, pipelines, and siphon is regulated under a separate FERC license (FERC Project No. 2337) than other components of the Prospect Diversion Project licensed as the Prospect Nos. 1, 2, and 4 Hydroelectric Project (FERC Project No. 2630).

Cultural Resource Study Results

A cultural resource survey was completed to satisfy the requirements of Section 106 of the National Historic Preservation Act (NHPA) of 1966 (as amended) and its implementing regulations at 36 CFR 800. The cultural resource survey has also been conducted in compliance with Oregon state laws concerning cultural resources and under the guidelines of the Oregon State Historic Preservation Office (Oregon SHPO 2011, 2013). The identified area of potential effects (APE) for the Project, as proposed by PacifiCorp, is the proposed FERC Project boundary. The previously identified and concurred upon APE for the Project is approximately 336.7 acres, of which approximately 38.1 acres are lands of the United States administered by the Forest Service. This area represents the FERC Boundary for the Prospect No. 3 Project as defined in the 1989 license term, which expires December 31, 2018. The Oregon SHPO provided concurrence with the identified APE by letter dated October 14, 2015; to date, no comments have been received from the consulting tribes as to the nature of the identified APE. PacifiCorp proposes to revise the Project boundary under the next license term to include critical access routes and exclude areas outside of Project influence. The proposed Project boundary and APE would occupy a total of 376.2 acres, of which approximately 52.5 acres are lands of the United States administered by the Forest Service.

Archaeological Resources

Records on file with the SHPO and the Forest Service show that 15 archaeological resources have been recorded within one mile of the Project area as a result of previously conducted cultural resource studies (Table 40). Historic-era archaeological resources identified tend to be associated with Prospect Hydroelectric projects or logging activities. Precontact resources have rarely been identified in this area. Those that have been recorded tend to be located near creeks and springs, on the flat basin landform between forested ridges and slopes.

Table 40. Previously recorded archaeological resources within 1 mile of the Project APE

Trinomial	Alternate ID	Description	Reference
		Precontact unknown-lithic debris scatter of unknown size	McKnight 1980

Trinomial	Alternate ID	Description	Reference
	Iso-1	Historic-era isolate-tobacco tin	PacifiCorp 2003
	Iso-2	Historic-era isolate-earthenware drain pipe	PacifiCorp 2003
	Iso-3	Historic-era isolate-amethyst glass fragment and metal barrel hoop	PacifiCorp 2003
	Iso-4	Historic-era isolate-tobacco tin	PacifiCorp 2003
	Iso-5	Historic-era isolate-earthenware drain pipe	PacifiCorp 2003
	Iso-6	Precontact isolate-biface fragment	PacifiCorp 2003
	RB-1	Precontact isolate-nine flakes	Ricks and Toepel 2004
	RR-223	Historic-era site-structural remains (North Daniel Cabin)	LaLande 1978; Long 1993; Oberg 1978
	RR-1023	Historic-era site-debris scatter (Flat Removal Dump #1)	Shafer 1986
	RR-1024	Historic-era site-debris scatter (Skeeters Log Camp)	Shafer 1986
	RR-1223	Historic-era site-structural remains (Imnaha Creek CCC Stove)	Werren 1988
	RR-1340	Precontact site-lithic debris scatter	Knutson 2000
35JA122	RR-06-10-06-269	Precontact site-lithic debris scatter	Throop 1980; LaLande 1980b
35JA497	RR-1713	Precontact site-lithic debris scatter	Knutson 2000

The archaeological survey for the relicensing of PacifiCorp's Prospect Nos. 1, 2, and 4 Hydroelectric Project intermittently intersects with the current APE for approximately seven miles between Structure 1/1 to the west and the sag-pipe to the east (PacifiCorp 2003). The previous survey was centered on the existing waterways for these 7 mi, whereas the current Project survey is centered on the transmission line. The transmission line generally follows the same alignment as the waterways. Six isolated finds (five historic-era and one precontact) were

identified during the previous archaeological survey; however, due to the scale at which the isolates were mapped, their exact locations were difficult to ascertain. Five of the isolates are likely within the current Project APE, or very close to the APE. Few shovel probes were excavated during the previous archaeological survey. No cultural material was identified in the shovel probe excavations (PacifiCorp 2003:15–16).

The North Daniel Cabin (RR-223) was documented in 1978, and determined to have been constructed between 1911 and 1920. The cabin was recommended not eligible for listing in the NRHP (LaLande 1978). A campground stove, presumed to have been built by the Civilian Conservation Corps in 1937, was identified. The stove was recommended not eligible for listing in the NRHP (Werren 1988).

Skeeters Log Camp in 1986 contained historic-era debris scattered around sawdust piles and modern outbuildings. No artifact details are described in the survey report or site form, but the camp is depicted on a 1956 map (United States Geological Survey [USGS] 1956). A nearby dump filled with debris dating to the 1930s–1950s may also be associated with the camp. The remains of the camp (RR-1024) and the trash dump (RR-1023) were recommended not eligible for listing in the NRHP (Shaffer 1986).

Two precontact lithic scatters have been identified. These two sites (35JA497 and RR-1340) are located within a flat basin and are unique in the area where few precontact resources have been identified (Knutson 2000).

Site 35JA122 was first identified during a cultural resource inventory for a timber sale on the Rogue River National Forest. The cultural resource technician noted “several chips of obsidian, chert, and red jasper” as well as one pestle, one arrowhead, and two “fleshers.” The artifacts were identified in areas disturbed from previous logging where soils were exposed. Subsequent to the initial site recordation, the Forest Archaeologist visited the site and examined the private land south of the previously recorded artifacts. It is unclear how large of an area was examined, but the archaeologist found five CCS flakes, one obsidian flake, and one obsidian “leaf-shape” projectile point (LaLande 1980b).

In Throop’s (1980) report, he includes a map of the timber sale project area, the locations where artifacts were found on Forest Service land (Site 35JA122), and a large polygon labelled “area where artifacts have been found on private land.” The private land polygon includes a portion of the current Project area. This polygon was later digitized to be the 35JA122 site boundary on file with SHPO. It is unclear where artifacts may have been previously identified on private land in this area. One previous cultural resource survey crossed through a small portion of the 35JA122 site boundary and did not identify any cultural material. That survey; however, reported the 35JA122 site boundary as limited to the Forest Service land north of the Project (PacifiCorp 2003:11).

The archaeological field investigations for the Project took place in two phases: first year studies were conducted from October 6–10, 2014 and October 18–22, 2014; and second year studies were conducted from October 21–23, 2015. Second year studies were conducted at Site 35JA927

(temporary field no. 2169-4). Approximately ten miles were surveyed (344 acres), and 80 shovel probes were excavated within the APE. One archaeological resource was previously recorded within the APE and the site boundary was expanded (35JA122), and four newly identified archaeological resources were recorded. These included two historic-era isolated finds (2169-2i and 2169-3i), one historic-era site (35JA928 [temporary no. 2169-1]), and one pre-contact site (35JA927 [temporary no. 2169-4]).

Isolate 2169-3i

Two tobacco tins were identified within 50 cm of each other on the ground surface. Both tins were completely rusted and missing their lids. The artifacts are pocket tobacco tins that consist of a flattened tin with a three-hinge lid. This type of tin was patented in 1907 and was manufactured throughout the early and mid-twentieth century (Waechter 2010). No remnants of the tins' labels were located. No additional artifacts were identified on or below the ground surface.

Site 35JA928 (Temp. No. 2169-1)

The site consists of historic-era artifacts and undiagnostic items found on the ground surface in an area measuring 14 by 12 meters. Artifacts include:

- one external friction metal lid embossed "OR/GLASS/COFFEEMAKERS";
- three hole-in-top metal cans;
- 10 sanitary cans;
- 10 unidentifiable metal can fragments;
- 10 fragments of white improved earthenware with a blue glaze;
- one white improved earthenware plate broken in 10 fragments
- one colorless glass bottle broken into 20 fragments with an external threaded closure and a base fragment embossed with "10B";
- one amber glass bottle with a handle, broken into 7 fragments; and
- approximately 10 colorless vessel glass fragments.

The majority of the items were not diagnostic to a specific time period. Hole-in-top cans were manufactured beginning in 1900 and were commonly used for evaporated milk (Waechter 2010). In general, the items identified at 35JA928 likely date to the mid-twentieth century and may be associated with construction or maintenance of the canal and/or transmission line. Five shovel probes were excavated outside of the surface-delineated site boundary to determine if the site extended and if there were subsurface artifacts. No cultural material was identified in the shovel probe excavations.

Isolate 2169-2i

The isolate is a single, oblong, colorless glass bottle with an external threaded closure. The body has a continuous side seam and the base has a suction scar, indicating it was made on an Owens' Automatic Bottle Machine (post-1905) (Lindsay 2015). The base is embossed with the "Diamond O-I" mark of an Owens' Illinois Glass Company bottle and "2/6/1," indicating it was manufactured in 1931 or 1941 based on the "1" year code. The plant code of "2" indicates the

bottle was manufactured at the Fairmont, West Virginia, plant that began operations in 1930 (Lockhart 2004). The sides of the bottle are embossed "MENNEN." The Mennen Company started in 1879 and sold a variety of toiletry products (Colgate 2015).No additional artifacts were identified on the ground surface. Four shovel probes were excavated around the isolate location to determine if subsurface artifacts were present. No artifacts were identified in the shovel probe excavations.

Site 35JA927 (Temp No. 2169-4)

Site 35JA927 (temporary no. 2169-4) was identified in APE during shovel probe excavations. A total of 22 shovel probes were excavated within an identified high probability area (HPA). Three shovel probes excavated on the southeast side of HPA did not contain cultural material. Artifacts were found in 8 of the 19 shovel probes excavated on the northwest side of the HPA. Shovel probes were excavated throughout the APE in this area in order to delineate the resource boundaries.

Ten artifacts were identified in eight shovel probes: eight obsidian flakes and two CCS flakes. Each shovel probe contained one flake, except for SP-56, which contained three flakes. The flakes were found at depths that ranged from 10 to 160 cm. As such, each shovel probe was excavated as deep as possible with a shovel (between 80 and 100 cm), and three shovel probes were extended to 180 cm with an auger. Ten artifacts were not found at Site 35JA927 until 19 shovel probes had been excavated within the HPA, thus making the resource a site (as opposed to an isolate). Therefore, each previous shovel probe that contained an artifact was excavated past the artifact depth. Once the tenth artifact was encountered (in SP-79), that shovel probe was terminated at 10 centimeters below surface (cmbs). No artifacts were collected.

Phase II work at 35JA927 consisted of the excavation of seven QTUs and one TU equaling 2.77 cubic meters (m^3) of matrix and representing 2.75 square meters (m^2) of the site's surface. Five of the QTUs (QTUs 1–5) were situated 10 m apart across the site and the remaining two QTUs (QTUs 6 and 7) were placed in the gaps between the other units (Figure 5-18). All of the QTUs were excavated to 70 cmbs and augured to a minimum of 180 cmbs, where possible. QTU 1 and QTU 7 were augured to 130 cmbs and 140 cmbs, respectively, terminating at shallower depths due to impenetrable cobbles. QTU 6 was augured to 190 cmbs. The TU (TU 1) was excavated in proximity to QTU 3—and in close proximity to SP 56—within roughly 5 m of the majority of the Phase I finds.

Table 41 presents the volume of matrix that was excavated for each unit, the density of artifacts in each unit, and the distribution of artifacts within each unit. The TU was excavated using a datum set 10 cm above the highest corner of the unit; the QTUs were excavated from the ground surface, without the use of a datum. For the ease of the reader, the below-datum-measurements within TU 1 have been converted to below-surface-measurements. Twelve pieces of debitage were identified in the subsurface tests: ten obsidian and two CCS pieces. Four out of the seven QTUs were negative for cultural material (QTUs 1, 4, 5, and 6). The remainder (QTUs 2, 3, and 7) contained only debitage in low quantities. TU 1 contained only debitage, as well. Debitage was found to a maximum depth of 120 cmbs. QTU 3 contained the highest density of artifacts of all the units excavated within 35JA927.

Table 41. Summary of excavated units during Phase II investigations at 35JA927.

Unit	Depth (cmbs)	Volume (m^3)	Density (n/m^3)	Results	Comments
QTU 1	130	0.186	0	No artifacts	Augured from 70–130 cmbs. Terminated due to impenetrable cobble pavement at 130 cmbs.
QTU 2	180	0.194	5	1 obsidian flake: 20 cmbs	Augured from 70–180 cmbs.
QTU 3	180	0.194	31	3 obsidian flake fragments: 0–10 cmbs; 1 CCS flake fragment: 20–30 cmbs; 1 obsidian flake fragment: 30–40 cmbs; 1 obsidian flake: 50-60 cmbs	Augured from 70–180 cmbs.
QTU 4	180	0.194	0	No artifacts	Augured from 70–180 cmbs.
QTU 5	180	0.194	0	No artifacts	Augured from 70–180 cmbs.
QTU 6	190	0.196	0	No artifacts	Augured from 70–190 cmbs.
QTU 7	140	0.187	11	1 obsidian flake: 50-60 cmbs; 1 obsidian flake: 120 cmbs	Augured from 70–140 cmbs. Terminated due to impenetrable cobble pavement at 140 cmbs.
TU 1	180	1.425	2	1 obsidian flake: 20–27 cmbs; 1 CCS flake: 27–30 cmbs; 1 obsidian flake fragment: 60–70 cmbs	Excavated as a QTU in northeast corner of TU from 130–180 cmbs.

Site 35JA122

Site 35JA122 was first identified during a cultural resource inventory in 1980. At that time, artifacts were found on Forest Service land north of the Project as well as an "area where artifacts have been found on private land" (LaLande 1980b; Throop 1980).

A small portion of that original site boundary on file with SHPO extends into the current APE. In total, 22 shovel probes were excavated to delineate the expanded site boundary of 35JA122. Seventeen shovel probes contained artifacts. Each shovel probe with artifacts was terminated immediately upon encountering an artifact. Newly identified artifacts include 36 CCS flakes, 7

obsidian flakes, and 4 CCS biface fragments. In addition, a small concentration of historic-era artifacts was identified on the ground surface within the newly expanded boundaries.

The southwestern-most corner of the previously mapped site boundary of 35JA122 extended into the current APE; southeast of that corner, HRA excavated nine shovel probes within the current APE. The first shovel probe (SP-4) was excavated 130 m east of the previous boundary because a gravel access road and a paved road prevented excavation. Of the nine shovel probes, six contained artifacts. These included 12 CCS flakes, 4 obsidian flakes, and 1 CCS biface fragment. The biface fragment was identified in the upper 10 cm of SP-9. The deepest artifact was found at 45 cmbs in SP-5. The site boundary, within the APE, is bounded by two shovel probes that did not contain artifacts (SP-11 and SP-12). SP-7 also did not contain artifacts, but other probes excavated to the east of it did; therefore, it is included in the site boundary. The site boundary has been expanded 300 m to the southeast.

HRA excavated 13 shovel probes within the current APE. Of these, six contained artifacts. Three shovel probes (SP-1 through SP-3) were excavated on a creek bank. All three of these contained artifacts, for a total of 13 CCS flakes and 2 obsidian flakes, which were all identified in the upper 15 cm of excavated soil. Two shovel probes were excavated on the opposite side of the creek (SP-30 and SP-31). No cultural material was identified in these two shovel probes; however, after excavation was complete, a crew member identified a biface fragment on the ground surface between SP-31 and the open canal.

Initially, SP-70, SP-71, and SP-72 were excavated to delineate the resource boundary of historic-era artifacts identified on the ground surface. However, precontact artifacts were found in each of the three shovel probes (seven CCS flakes and one obsidian flake) and, after the probes were terminated, precontact artifacts were identified on the surface. The Site 35JA122 boundary was expanded to include these artifacts, and additional shovel probes were excavated to delineate the resource boundaries. One additional surface artifact was found that had not been identified during the initial pedestrian survey (west of SP-74).

Precontact artifacts on the ground surface included two CCS biface fragments and four CCS flakes. The historic-era artifacts were in an area measuring approximately 16 by 4 m and consisted of approximately 18 pull-tab cans. These included seven “7up” brand cans, six “Orange Crush” brand cans, two “Fresca” brand cans, and three unidentifiable brand cans. Pull tabs were manufactured beginning in 1962 and continued to be manufactured until the early 1980s (Miller et al. 2000). The newly delineated site boundary is bounded by two shovel probes that did not contain artifacts (SP-75 and SP-76). The 35JA122 boundary was extended 100 m in one direction, and 200 m in another direction.

Historic Structures

Records on file with the SHPO show nine historic-era buildings or structures (including two historic districts) recorded within one mile of the Project area as a result of previous cultural resource studies (Table 42). In addition, one cemetery was previously identified. These resources

are associated with early settlers in the town of Prospect, transportation, and hydroelectric development.

Table 42. Previously recorded historic-era buildings and structures within 1 mile of the Project APE

Construction Date	Resource	NRHP Eligibility	Reference
ca. 1910	G. C. Hollenbeak House	Eligible	Clay 1979a
1892	Prospect Hotel (A. H. Boothby House)	Listed	Atwood 1979; Clay 1979c
ca. 1930	Episcopal Parsonage	Eligible	Clay 1979d
ca. 1935	Good Shepherd Episcopal Church	Eligible	OHSD n.d.
ca. 1910	William Grieves House/Katydid Ranch	Eligible	Clay 1979e
ca. 1935	Rogue River Timber Company House	Eligible	Clay 1979f
ca. 1925	Jackson County Bridge No. 733	Eligible	Clay 1979g; PacifiCorp 2002
1911–1944	Prospect Hydroelectric Project Historic District	Eligible	PacifiCorp 2002; Perrin and Miller 2013
1910–1925	Crater Lake Highway Historic District	Eligible	Bell 2011
1886–1906	Prospect Cemetery/Dean Hill Cemetery	Unevaluated	Byrd 2001; PacifiCorp 2003

The G. C. Hollenbeak House was constructed in 1910, and the family ran a cattle operation (Clay 1979a). The Oregon Historic Sites Database (OHSD) notes the property eligible for listing in the NRHP. There are still cattle on this ranch today, and a portion of the property (but not the house) is within the APE. The Prospect Hotel was built in 1892 by A. H. Boothby. The hotel is listed in the NRHP (Atwood 1979) and is still in use today.

The Crater Lake Highway, which largely paralleled the modern route of Highway 62, was constructed in the early twentieth century. Portions of the original Crater Lake Highway, including Mill Creek Drive in Prospect, are still used today. The historic alignment extends through the Project APE between Structures 9/3 and 10/3. The section between Cascade Gorge and Prospect, within the county right-of-way, has been recorded as part of the Crater Lake Highway Historic District, which is eligible for listing in the NRHP (Bell 2011). Jackson County Bridge No. 733 is part of the original Crater Lake Highway, is within the historic district, and is a contributing structure to the historic district (Atwood 1991; Bell 2011; Clay 1979g).
A local landowner worked with a Pacific Power and Light employee in 1973 to relocate a small cemetery near the Project area prior to a highway construction project. Using historic records, it was determined that there had been six burials in this small plot with dates between 1886 and 1905. Pacific Power and Light built a chain link fence around the cemetery and marked the graves with headstones (Byrd 2001:389; Guernsey 1973). The Prospect Cemetery was previously

relocated in 2000 and appeared to be in good condition (PacifiCorp 2003:19). The cemetery is outside of the Project APE.

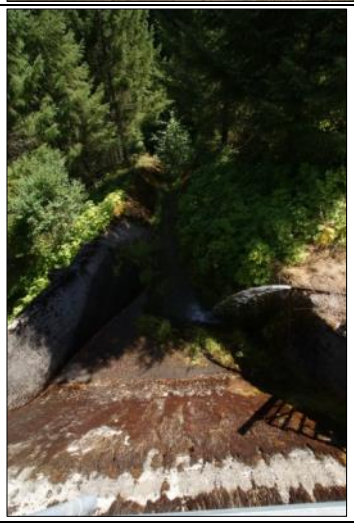
The historic hydroelectric resources directly associated with the operation of Prospect Nos. 1, 2, and 4 were documented in 2000 and again in 2011. Facilities were constructed between 1911 (Prospect No. 1) and 1944 (Prospect No. 4), and some are within the current APE. The hydroelectric resources associated with Prospect Nos. 1 and 2 were determined eligible for listing in the NRHP as part of the Prospect Hydroelectric Project Historic District (period of significance 1911 to 1933). The hydroelectric resources associated with the operation of Prospect No. 4 were originally evaluated as not eligible for listing in the NRHP (PacifiCorp 2002); however, recent inventories suggest the period of significance extends to 1944 and that the eligible district includes Prospect No. 4 (OHSD 2011; Perrin and Miller 2013).

The building and structure inventory for the Project was conducted on August 12, 2014. A reconnaissance-level survey was conducted, and all buildings and structures within the Project were recorded. Details about each resource were documented, and photographs were taken. The historic-era resources identified as part of the Prospect No. 3 Hydroelectric Project are presented roughly upstream to downstream as they would be encountered on the Project. A table providing photographs and dates of each recorded resource is provided in Table 43.

Table 43. Documented Project resources

Name	Date	Description	Eligibility	Photo
Prospect No. 3 Impoundment	1932	Impoundment	Contributing	
South Fork Diversion Dam and Spillway	1932	Structure	Contributing	

Name	Date	Description	Eligibility	Photo
South Fork Diversion Dam Intake and Control Building	1932, altered	Structure	Contributing	
South Fork Diversion Dam Fish Passage (Ladder, Fish Screen, Return Pipe)	1932, altered 1996	Structure	Contributing	
South Fork Conduit (Water Conveyance System)	1932	Structure	Contributing	
South Fork Canal Gage Station	1949	Building	Noncontributing	

Name	Date	Description	Eligibility	Photo
Wildlife Crossings	ca. 1995	Structure	Noncontributing	
Prospect No. 3 Control House	ca. 1990	Building	Noncontributing	
Prospect No. 3 Powerhouse	1932	Building	Contributing	
Prospect No. 3 Powerhouse Tailrace and Spillway	1932	Structure	Contributing	

Name	Date	Description	Eligibility	Photo
Prospect Transmission Line	1932	Structure	Contributing	

In addition to resources related to the Prospect No. 3 Hydroelectric Project described above, two heretofore unrecorded resources of the Prospect Nos. 1, 2, and 4 Hydroelectric Project were recorded during the field investigations. The Prospect Sag-pipe (Inverted Siphon) has been previously recorded (PacifiCorp 2002) and is discussed here as its proposed replacement is part of the new license term.

Barr Creek Canal Overflow Spillway

This abandoned segment of concrete-lined canal is approximately 264 ft in length and 3 ft wide, extending from Middle Fork Canal to Barr Creek. The canal likely acted as an overflow from the Middle Fork Canal to Barr Creek. The concrete-lined segment appears to have been abandoned but was likely constructed as part of the overall Prospect Diversion Project No. 2001, circa 1932.

Prospect Sag-pipe Transition Structure

Also constructed as part of the Prospect Diversion Project No. 2001 in 1932, the Prospect Sag-pipe Transition Structure (referred to as the "Prospect Turnout" on one historic-era photo) is part of the overall linkage between the Project and the Prospect Nos. 1, 2, and 4 Hydroelectric Project. The transition structure is a rectangular structure constructed of board-formed concrete that houses a manually operated tainter gate. The structure enables water from the Prospect No. 3 Project to enter the Middle Fork Canal via the sag-pipe.

Prospect Sag-pipe (Inverted Siphon)

The Prospect Sag-pipe was previously recorded as the Prospect Inverted Siphon, and has been determined eligible/contributing to the Prospect Hydroelectric Project Historic District. Water from the Prospect No. 3 tailrace is conveyed to the Prospect Nos. 1, 2 and 4 Hydroelectric Project by means of the sag-pipe/inverted siphon. Water discharges from the Prospect No. 3 powerhouse into an open basin, from one side of which a wood-stave and steel pipe siphon carries a maximum of 150 cfs across the Middle Fork Rouge River to the Middle Fork canal. A segment of the original wood stave pipeline was replaced circa 1965 following a major flood event that took place in December 1964. The sag-pipe is scheduled for replacement in 2021.

Additional Resources

Three structures not affiliated with PacifiCorp projects or operations were recorded within the Project: Nye Ditch, Crater Lake Highway Historic District, and Oregon Department of Transportation (ODOT) Bridge 16017.

Nye Ditch. Nye Ditch crosses the Project APE near Structure 4/1, between Highway 62 and the Prospect Central Substation. Additionally, a diversion associated with the northern segment of Nye Ditch extends underground through the APE, emptying into the Middle Fork Canal. Nye Ditch was constructed in two segments between 1920 and 1921. The extent of the northern segment is unknown, but was historically located north of Prospect and was used until the 1950s. One previously documented remnant, in ruin, is 2 miles north of the Project APE just east of Highway 62 (Shafer 1989).

The southern segment of Nye Ditch (including where it crosses the APE) is 6.5 miles long extending between Prospect and Cascade Gorge. The resource is an unlined earthen ditch that briefly parallels the elevated flume underneath the transmission line. This segment is still used for irrigation by area residents (Nye Ditch Users Improvement District 2014). The Nye Ditch Diversion flows south to the canal through an underground tunnel. Its date of construction is unknown. As the Middle Fork Canal was constructed between 1926 and 1928, the diversion likely post-dates the original ditch construction.

Crater Lake Highway Historic District. Crater Lake Highway was built between 1910 and 1925 after a movement by local officials to create an accessible and permanent route to Crater Lake. Prior to the highway, a treacherous wagon road between Jacksonville and Fort Klamath was the only route through this region. Crater Lake Highway was utilized until the 1960s when the modern alignment of Highway 62 was constructed. Portions of Crater Lake Highway are still intact, including modern Mill Creek Drive, which extends through the Project APE between Structures 9/3 and 10/3. The resource is a paved, two-lane road. The intact segment of Crater Lake Highway, between Cascade Gorge and the intersection of Mill Creek Drive with Highway 62, has been recorded as part of the Crater Lake Highway Historic District. The district has been determined eligible for listing in the NRHP (Bell 2011).

ODOT Bridge 16017. ODOT Bridge 16017 is located within the Project APE between Structures 5/4 and 6/4 at milepost 42.19 on Highway 62. Built in 1963, the structure is a 167-ft-long reinforced-concrete deck-girder bridge (ODOT 2014). The bridge is a two-lane structure with an asphalt wear surface and closed concrete side walls. The bridge spans the Prospect Nos. 1, 2, and 4 flumes, which convey water from the Prospect No. 2 Forebay to the Prospect No. 4 powerhouse. The bridge was constructed over two pre-existing flowlines that convey water from the Prospect No. 2 forebay to the Prospect No. 2 powerhouse; original design drawings indicate that the bridge was also designed to accommodate for a third flowline (never constructed).[25] As originally constructed, the bridge followed the standard specifications for the construction of roads and bridges of Federal Highway Projects, as detailed in the manual of the Bureau of Public

[25] California Oregon Power Co. Flume Overcrossing, STA. 1032, Crater Lake Highway, Oregon Forest Highway Project 17, Bridge 16017. On file with the Oregon Department of Transportation, Salem, Oregon.

Roads FP61. The original aluminum rails and posts were replaced with concrete barriers and metal guardrails ca. 1996.[26]

E.6.10.2 Project Effects

Archaeological Resources

Isolates 2169-2i and -3i

Both isolates are likely related to construction or maintenance of Project facilities (i.e., canal or transmission line). There have been numerous disturbances to the landscape in the vicinity of the isolated finds due to the facilities, including an access road adjacent to 2169-2i and an artificial berm on which 2169-3i is situated. PacifiCorp recommends that neither isolate is eligible for listing in the NRHP. While the hydroelectric facilities are eligible for listing in the NRHP under Criterion A (Events), these isolated finds do not contribute to the eligibility of the facilities. The artifacts are not associated with the lives of significant persons in our past (Criterion B), nor do they represent the work of a master of a distinctive period (Criterion C). The two isolates do not have the potential to yield important information to the history of the area (Criterion D) as these types of artifacts are common and similar isolated finds have been previously identified in the general Project vicinity. PacifiCorp does not recommend any additional cultural resource studies at these two isolate locations. In a letter dated October 14, 2015, the Oregon SHPO concurred with these recommendations. Isolates 2169-2i and 2169-3i are not eligible for the NRHP. No additional cultural resource investigations are required for actions pertaining to these isolates.

Site 35JA928

The debris scatter may be related to the construction or maintenance of the adjacent Project facilities. PacifiCorp recommends that the resource is not eligible for listing in the NRHP. While the adjacent hydroelectric facilities are eligible for listing in the NRHP under Criterion A (Events), this sparse debris scatter does not contribute to the eligibility of those facilities. The site is not associated with the lives of significant persons in our past (Criterion B), nor do the artifacts represent the work of a master of a distinctive period (Criterion C). The site does not appear to have the potential to yield important information to the history of the area (Criterion D). There is no subsurface component and few of the artifacts are diagnostic of a specific time period. The surface deposit is sparse and most of the artifacts are fragmented. PacifiCorp does not recommend any additional cultural resource studies at this location. In a letter dated October 14, 2015, the Oregon SHPO concurred with these recommendations. Site 35JA928 is not eligible for the NRHP. No additional cultural resource investigations are required for actions pertaining to this site.

[26] Personal communication with Chris Bell, Oregon Department of Transportation, July 20, 2016.

Site 35JA927

Site 35JA927 is a precontact lithic material site and does not appear to meet the NRHP criteria. Neither the background research nor the excavations at the site suggest that the pieces of debitage found at 35JA927 are associated with important historical events (Criterion A) or figures (Criterion B) or represent a unique or exemplary design or the work of a master (Criterion C). Site 35JA927 is not clearly associated with a specific cultural phase, much less a particular person or known historical event. And because the site includes only debitage, and a high percentage of fragmentary flakes at that, the site does not represent the work of a master.

Site 35JA927 was also considered for eligibility for NRHP listing under Criterion D for its potential to contain important information regarding the prehistory of the region. Excavations were conducted across the site to greater depths than the cultural deposits. These excavations indicate that the site is a sparse scatter of lithic debitage without temporally diagnostic tools or buried cultural features. The site appears disturbed by a combination of historical or modern construction activities and bioturbation by plants and animals. While the site is wholly within the Mount Mazama ash flow deposits, there does not appear to be a discrete cultural component— the finds are scantily dispersed through all three strata. As such, 35JA927's research potential is quite limited, and it does not appear to meet Criterion D.

In general, the site also appears to lack integrity. The investigations were designed to address the relevant aspects of integrity for evaluating resources: location, design, setting, materials, workmanship, feeling, and association. The cultural deposits from 35JA927 appear altered by bioturbation and historic construction activities. The horizontal and vertical disturbances across the site, the singularity of artifact types within the site, and lack of buried features or discrete cultural components (each discussed in more detail above) are indicators that the site lacks the location, design, workmanship, and association aspects of integrity. The construction of the Project through the site altered the area within and around the site from forested creek-side terrace to open utility corridor, and because of this the site appears to have lost integrity of setting and feeling— both of which require consistencies between the past and present environments/landscapes. Finally, though the site may retain integrity of materials, as the site consists entirely of lithics which do not suffer from the same preservation issues as organics, one out of the seven aspects of integrity is, in this case, not enough to claim that 35JA927 retains integrity.

Site 35JA927 does not meet any of the four NRHP evaluation criteria. Moreover, the site does not appear to retain integrity. Thus, PacifiCorp recommends the site to be not eligible for listing in the NRHP and that future Project-related construction activities at the site proceed as necessary without adverse impact to cultural resources. In a letter dated July 6, 2016, the Oregon SHPO concurred with these recommendations. Site 35JA927 is not eligible for the NRHP. No additional cultural resource investigations are required for actions pertaining to this site.

Site 35JA122

The site has not been evaluated for NRHP eligibility, and a conclusive determination of eligibility will not be possible due to the site's extent outside of the APE. For this reason, PacifiCorp recommends cultural resource investigations, as needed, when there is a proposed Action within the revised site boundaries. This process would be outlined in the HPMP for the Project, described below. Until the HPMP is complete, any proposed Action within the 35JA122 boundaries would be addressed through consultation with all stakeholders.

Historic Structures

Though licensed separately, the Prospect Nos. 1, 2, and 4 Hydroelectric Project and the Prospect No. 3 Hydroelectric Project are intertwined both physically and historically. Buildings and structures of Prospect No. 3 directly related to hydroelectric power production are recommended eligible to the NRHP as part of the Prospect Hydroelectric Project Historic District, which also encompasses resources of the Prospect Nos. 1, 2, and 4 Hydroelectric Project. The District is eligible under Criterion A, for contributions to the development and growth of hydroelectric power production along the Rogue River and its tributaries. Resources of the Prospect Hydroelectric Project Historic District are also recommended eligible under Criterion C when they convey a visual sense of the engineering practices of the historic district that date to the period of significance. The period of significance is 1911–1944, and encompasses the original construction of the Prospect Hydroelectric Plant (Prospect No. 1) in 1911 and culminates in construction of Prospect No. 4 in 1944. Areas of significance include conservation and engineering.

Not all resources of the Project contribute to its eligibility. Table 43 above provides a brief synopsis of recommended contributing and noncontributing resources. Newly documented resources that are part of the Prospect Nos. 1, 2, and 4 Hydroelectric Project (Barr Creek Canal Overflow Spillway and Prospect Sag-pipe Transition structure) are both recommended to be contributing resources to the Prospect Hydroelectric Project Historic District.

Anticipated Actions to historic buildings and structures over the course of the Project license are limited to replacement of the sag-pipe and the 5,448-ft-long wood-stave flowline. Both pipes are eligible under Criteria A and C as contributing to the historic district. The pipes would be replaced with steel in the same alignment and massing (size/shape) as the current wood-stave. Replacement of wood-stave with compatible substitute steel pipeline allows for continued and improved operations at the Project, and has been an accepted treatment for the replacement of historic-era wood-stave pipes in the past (see the Prospect 1, 2, and 4 flowlines, OHSD 2011).

As defined in 36 CFR Part 800, an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Examples of adverse effects include physical destruction of or damage to all or part of the property and alteration of the

property, including repair and maintenance that is not consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties (36 CRF Part 68), among others. Replacement of the wood-stave pipeline and sag-pipe would alter materials of the Project, specifically those of the South Fork Conduit (Water Conveyance System) and the Prospect Sag-pipe (Inverted Siphon), both contributing structures to the Prospect Hydroelectric Project Historic District. For the South Fork Conduit, the repair/replacement would be made in the same alignment and massing (size/shape) as the current wood-stave pipe. For the Prospect Sag-pipe, the repair/replacement would be made in the same alignment and massing (size/shape) as the current wood-stave and steel pipe.

Replacement of wood-stave with compatible substitute steel pipeline complies with the Secretary of the Interior's Standards for Rehabilitation. Rehabilitation Standard No. 6 specifies that "deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials" (36 CFR 67.7.b). While replacement of wood stave with steel does not meet the requirement for materials, PacifiCorp is committed to maintaining the original design in regards to alignment and massing. Further, the overall integrity of both the South Fork Conduit (water conveyance system) and the Prospect Hydroelectric Project as a whole would not be diminished to such an extent that the property would no longer be eligible for inclusion in the NRHP. However, cumulative maintenance actions such as these, where removal of historic-period materials (wood) are replaced with modern materials (steel) can be viewed as adverse over time.

As such, PacifiCorp recommends a finding of an adverse effect to a historic property for the removal and replacement of the two resources, specifically the South Fork Conduit (Water Conveyance System) and the Prospect Sag-pipe (Inverted Siphon). SHPO requested the adverse effect be mitigated via recordation, either a state-level engineering report similar to a Historic American Engineering Report, or via an entry in the Oregon Encyclopedia, or some other form of public history interpretation (such as an entry into a public history mobile application). The details of the mitigation would be formalized in the HPMP. No additional cultural resource mitigation is recommended aside from recordation of the Prospect Hydroelectric Project resources enclosed herein.

E.6.10.3 Proposed Environmental Measures

PacifiCorp proposes to prepare a Historic Properties Management Plan (HPMP) to define a process by which cultural resource issues would be addressed throughout the life of the license to ensure continued compliance with Section 106 of the NHPA. Stakeholders would be provided the opportunity to comment on and inform the HPMP. As requested in a letter submitted to FERC dated March 31, 2014, the Cow Creek Cultural Resources Program must be consulted regarding the assessment of effects and the resolution of adverse effects to identified historic properties and consulted regarding any Programmatic Agreement (PA), Memoranda of Agreement (MOA), or HPMP. Other appropriate Tribes and stakeholders would be consulted as well. The HPMP would describe the process for monitoring or additional cultural resource investigations when PacifiCorp has a proposed Action within archaeological sites, including the

revised site boundaries of 35JA122. As previously mentioned, due to the large size of this site and its presence outside of the Project APE, Phase II evaluative testing is not recommended at this time for the entire site. Future Actions would likely be small and localized. The HPMP would describe the types of potential Actions and the necessary efforts required within Site 35JA122 and any other known or unknown archaeological sites.

The historic buildings and structures of the Prospect No. 3 Hydroelectric Project are both historically and physically integrated with the resources of the Prospect Nos. 1, 2, and 4 Hydroelectric Project. The combined resources are NRHP-eligible as the Prospect Hydroelectric Project Historic District; however, individual buildings and structures are managed under separate FERC licenses. As such, the resources of the Prospect No. 3 Hydroelectric Project would be managed separately from those of the Prospect Nos. 1, 2, and 4 Hydroelectric Project with a license-specific HPMP.

PacifiCorp's estimated cost for implementation of the HPMP is $3,000 per year.

E.6.10.4 Unavoidable Adverse Impacts

The proposed Project would not result in any unavoidable adverse impacts to archaeological resources.

The proposed Project would result in permanent, site-specific adverse impacts to historic properties via the removal and replacement of the South Fork Conduit (Water Conveyance System) and the Prospect Sag-pipe (Inverted Siphon). These adverse impacts would be mitigated through recordation in a state-level engineering report, similar to a Historic American Engineering Report, via an entry in the Oregon Encyclopedia, or via some other form of public history interpretation.

E.6.11 Tribal Resources

E.6.11.1 Affected Environment

The Oregon State Legislative Commission on Indian Services has identified the following Native American Indian Tribes as being associated with the region where the Project is located:

- Confederated Tribes of Grande Ronde
- Confederated Tribes of Siletz Indians
- Cow Creek Band of Umpqua Tribe of Indians

There are no tribal lands within or immediately adjacent to the Project area. In a letter dated April 17, 1985, the Bureau of Indian Affairs stated that the Project "has no impact on Indian trust rights or resources subject to the jurisdiction of the Bureau of Indian Affairs."

PacifiCorp is not currently aware of any tribal cultural, economic or resource interests that would be potentially affected by continued maintenance and operation of the Project. On February 1, 2013, PacifiCorp sent letters to the tribes identified above and the U.S. Bureau of Indian Affairs requesting any information on resources potentially affected by the Project. A response was received from the Cow Creek Band. The response acknowledges that the Project is within the ancestral territory of the Cow Creek Band, but it does not identify any specific tribal resources within the Project Vicinity.

E.6.11.2 Project Effects

The proposed Project would not result in effects to any known tribal resources, including Traditional Cultural Properties.

E.6.11.3 Proposed Environmental Measures

PacifiCorp proposes to implement a Historic Properties Management Plan (HPMP) for the protection and/or mitigation of known and heretofore undiscovered tribal resources within the existing and proposed Project boundary. The HPMP is included as Appendix D of Volume III of the license application.

E.6.11.4 Unavoidable Adverse Impacts

No unavoidable adverse impacts to tribal resources were identified during Project scoping or technical studies.

E.6.12 Socio-economic Resources

E.6.12.1 Affected Environment

Jackson County encompasses over 1.7 million acres of land with the overwhelming majority of this acreage committed to uses compatible with open space values, such as timber production, livestock, cropland, and designated wilderness and recreation areas (Jackson County Planning Department, 2004). Over 50 percent (955,365 acres) of the County's land area is owned by the federal government and managed by the Forest Service and BLM (Figure 1). Table 44 below presents land use figures from the Jackson County Comprehensive Plan (2004).

Table 44. Land uses within Jackson County, Oregon and the Project vicinity

Land Use Category	Jackson County		Project Vicinity	
	Total Acres	Percentage	Total Acres	Percentage
Aggregate Removal	6,392	0.4%	0	0.0%
Agricultural	249,801	14.2%	828	2.6%
Commercial	936	0.1%	35	0.1%

Land Use Category	Jackson County		Project Vicinity	
	Total Acres	Percentage	Total Acres	Percentage
Forestry/Open Space	1,454,128	82.5%	30,675	95.6%
Industrial	4,173	0.2%	0	0.0%
Limited Use	248	0.0%	10	0.0%
Rural Residential	42,645	2.4%	305	1.0%
Urban Residential	3,969	0.2%	234	0.7%
Total	1,762,292	100.0%	32,087	100.0%

The U.S. Census Bureau estimated the 2010 population of Jackson County to be 203,206 (United States Census Bureau, 2010). The 2000 census recorded a population of 181,269 for the County (Untied States Census Bureau, 2000). Thus, there is an estimated increase in population of 12.1 percent between 2000 and 2010. Approximately 70 percent of Jackson County residents live in 11 incorporated cities in the Bear Creek and Rogue River Valleys (Jackson County, 2013). The population of the community of Prospect is estimated at 650 (Shady Cover-Upper Rogue Chamber, 2013).

Historically, the economy of Jackson County was based on timber and, because of its mild weather, agriculture. Currently, health care is the principal employment group in the County, primarily because of the County's position as a desirable retirement community (Jackson County, 2013). Retail and manufacturing are the second largest employment groups followed by government employment, buoyed by the significant amount of government-administered lands in the County (Jackson County, 2013). Timber, agriculture, and ranching remain important industries in the County and, more specifically, in the vicinity of the Project. The County exhibits an unemployment rate of 11.4 percent, above the state average of 9.8 percent for the same period of 2007 through 2011 (United States Census Bureau, 2011).

The Project is staffed by four on-site operators with support from additional crews from PacifiCorp's Medford Hydro Operations staff. The Project has only a minor influence on the local labor market.

E.6.12.2 Project Effects

As described above, the Project has only a minor influence on the local labor market. However, continued operation of the Project would have a modest positive effect on socioeconomic conditions within the region. Although relatively small compared to most hydropower projects, the power generated by the Project would offset negative impacts associated with non-renewable energy sources. Project generation does not produce any greenhouse gases or other air pollutants, and as a result, the Project helps to maintain local air quality and address concerns about anthropogenic contributions to climate change and depletion of the ozone layer. It is expected

that the power generated at the Project would meet local electrical load resulting in the majority of economic benefits remaining in the local area.

E.6.12.3 Proposed Environmental Measures

PacifiCorp does not propose any measures with respect to socio-economic resources.

E.6.12.4 Unavoidable Adverse Impacts

No unavoidable adverse impacts to socio-economic resources were identified during Project scoping or technical studies.

E.7 ECONOMIC ANALYSIS

E.7.1 Operations and Maintenance Costs

Operations and maintenance (O&M) costs can vary significantly from year-to-year. PacifiCorp estimates are based on historical data as well as budget forecast estimates.

Annual routine O&M costs are $609,433 in 2016$, totaling $26.2 million over a 43-year analysis period[27]. This estimate is based on the average of the prior three years of FERC Form 1 costs directly attributable to the Project, inflated to 2016$, and reduced by relicensing implementation expenses. Non-routine O&M (e.g., generator cleaning, impoundment dredging, et al.) costs are estimated to average $50,744 annually, totaling $2,182,000 over the 43-year period.

The Project has been certified to meet the criteria for low environmental impact as determined by the Low Impact Hydropower Institute (LIHI; LIHI Certificate No. 109). As a result of this certification, the Project is eligible for Renewable Energy Credits (RECs), estimated at $1.00 per MWh of generation based on forecasts by PacifiCorp's Energy Supply Management department. The value of the Renewable Energy Credits is $24,719 annually, totaling approximately $1,062,915 over the 43-year period. For analysis purposes, the value of the Renewable Energy Credits is counted as cash received, which reduces non-routine O&M costs.

The total estimated average annual O&M expense for the no action alternative, including routine and non-routine O&M and RECs, is $671,551 in 2016$.

The total estimated average annual O&M expense for the proposed Project includes the no action alternative costs in addition to the cost of Protection, Mitigation, and Enhancement Measures (PM&Es). The annual estimated O&M expense for PM&Es (e.g., management plan implementation; in-stream flow release maintenance, monitoring, and reporting; et al.) is

[27] Three remaining years of the current license (2016-2018) were added to an assumed 40-year new license period (2019-2058) for a total financial analysis period of 43 years. A 40-year license term was selected as the median of the range of FERC license terms from 30 to 50 years.

$36,093, totaling $1,552,000 over the 43-year period. Annual and total estimated O&M costs in the no action and proposed Project alternatives are summarized in Table 45.

Table 45. O&M Costs in the no action and proposed Project alternatives (2016-2058)

Item	Annual Average (in 2016$)	43-Year Total (in 2016$)
Routine O&M	$609,433	$26,205,619
Non-routine O&M	$50,744	$2,181,992
Renewable Energy Credits	($24,719)	($1,062,915)
Total O&M in No Action Alternative	**$635,458**	**$27,324,699**
PM&E Measures O&M	$36,093	$1,551,999
Total O&M in Proposed Project Alternative	**$671,551**	**$28,876,695**

E.7.2 Protection, Mitigation, and Enhancement Measure Costs

As noted in E.7.1, the annual estimated O&M expense for PM&Es is $36,093, totaling $1,552,000 over the 43-year period. The total estimated capital cost of PM&Es is $14,952,026 in 2016$. PM&E cost estimates are itemized and summed below in Table 46.

Table 46. Protection, mitigation, and enhancement measure costs (in thousands of 2016$; 2019-2058)

Protection, Mitigation, and Enhancement Measure	Average Annual Cost ($000)	Total Cost ($000)
Operations and Maintenance		
Fish Passage Facilities O&M Plan	5	200
Instream Flow Release Maintenance	2	80
Instream Flow Monitoring and Reporting	3	142
Implementation Process Costs	5	200
Erosion and Sediment Control Plan	5	210
ODEQ Annual Payment	9	400
Vegetation Management Plan	3	120
Wildlife Crossings Maintenance	2	80
Cultural Protection/HPMP	3	120
O&M Subtotal	**36**	**1,552**
Capital		
Woodstave Flowline Replacement	270	11,624
Woodstave Sagpipe Replacement	50	2,154
Ramping Control Improvements	1	35
South Fork Flowline Bridge Rehab	5	222

Protection, Mitigation, and Enhancement Measure	Average Annual Cost ($000)	Total Cost ($000)
Wildlife Crossings Construction	6	259
Dredge Disposal Spur Road	3	125
Auxiliary Minimum Flow Supply	7	300
Minimum Flow Controls Automation	1	35
Fish Ladder Modifications	1	41
Fish Bypass Return Pipe Realig./Ext.	4	158
Capital Subtotal	**348**	**14,952**
Total PM&E Costs	**384**	**16,504**

E.7.3 Value of Developmental Resources

E.7.3.1 Current License

The current net book value of the Project as of December 31, 2015 is shown below (in thousands of dollars) in Table 47.

Table 47. Net book value of the no action alternative as of December 31, 2015

Item	Capital Investment ($000)
Original Cost	$10,078
Accumulated Depreciation	($6,852)
Net Book Value	**$3,227**

The estimated annual cost to own and operate the Project's existing assets and major capital projects for 43 years, excluding costs for license compliance and implementation, is $18,282,478. The annual cost per MWh to operate the Project, based on 35,050 MWh of generation, is $35.48.

E.7.3.2 Proposed Project

The current net book values of the existing assets, plus additional capital spend associated with the proposed Project, are shown below (in thousands of dollars) in Table 48.

Table 48. Net book value of the proposed Project

Item	Capital Investment ($000)
Net Book Value	$3,227
License Application Costs	$1,885
Protection, Mitigation, and Enhancement Measure Costs	$14,952
Operational Capital	$593
Total Capital Investment:	**$20,657**

The estimated costs to develop the Final License Application are approximately $1,884,575. This includes consultant and applicant costs. Consultant costs pertain to relicensing study planning, study implementation, study reporting, administration, and meetings. PacifiCorp costs include the same cost categories as consultant costs, as well as staff time, overhead, equipment, and services purchased.

The total present value costs of operating the proposed Project for a 43-year period are shown below (in thousands of dollars) in Table 49. The present value of the energy lost from the no action alternative (10 cfs minimum in-stream flow) to the proposed Project alternative of 30 cfs from March 1 through July 31 and 20 cfs from August 1 through February 28 minimum in-stream flow over the 43-year period is $3.1 million or $5.97 per MWh. The total present value cost of operating the proposed Project, including routine, non-routine, and PM&E O&M; operations, license implementation, and PM&E capital; property and income taxes; depreciation and amortization; and deferred taxes (excluding lost generation) for 43 years is $36,347,745, or $70.54 per MWh.

Table 49. Present value costs of the proposed Project (2016-2058).

Item	Present Value ($000)
Future Operations Including PM&E Costs	$36,348
Lost Generation from 20/30 cfs Minimum Flow Measure	$3,075
Total Present Value Cost:	**$39,423**

E.8 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the Federal Power Act (FPA), 16 U.S.C. section 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving a waterway or waterways

affected by a project. PacifiCorp reviewed the plans that were identified in the Pre-Application Document (PacifiCorp, 2013), Scoping Document 2 (FERC, 2013), and the most-recent FERC listing of comprehensive plans for Oregon (FERC, 2015) to determine which of the plans may be relevant to the Project. A total of twenty-six comprehensive plans were identified as relevant to the Project. Each relevant plan is identified below with a statement on whether the proposed Project would, would not, or should not comply with the plan. Relevant resource agency or tribal determinations regarding the consistency of the Project with a listed comprehensive plan are also described.

1. Bureau of Land Management. Medford District resource management plan. Medford, Oregon. 1995.

The Medford District resource management plan responds to the need for a healthy forest and rangeland ecosystem with habitat that would contribute toward and support populations of native species, particularly those associated with late successional and old-growth forests. It also responds to the need for a sustainable supply of timber and other forest products that would help maintain the stability of local and regional economies and contribute valuable resources to the national economy on a predictable and long term basis. The plan emphasizes protection of older forests, and management and enhancement of values or uses, such as dispersed, non-motorized recreation activities and scenic resources.

The existing and proposed Project boundary is not located on any BLM-administered lands. The Project bypassed reach of the South Fork Rogue River crosses three parcels of land administered by the BLM downstream of the Project near the confluence of the South and North Fork Rogue Rivers (PacifiCorp, 2015). The Project bypassed reach is not within any areas designated as key watersheds, watershed reserves, late successional reserves, sensitive soils, big game areas, or recreation sites. The Project would not impact any of the survey strategies, management actions, or land use allocations identified by the plan, and therefore, the Project would comply with the plan.

2. Bureau of Land Management. Forest Service. Standards and guidelines for management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Washington, DC. April 1994.

The 1994 Record of Decision for Amendments to Forest Service and BLM Planning Documents within the Range of the Northwest Spotted Owl, also known as the Northwest Forest Plan (NFP) includes the Standards and Guidelines for Management of Habitat for Late Successional and Old Growth Forest Related Species within the Range of the Northern Spotted Owl. The plan presents a combination of land allocations managed primarily to protect and enhance habitat for late-successional and old-growth forest related species and standards and guidelines for the management of the land allocations. These land allocations are separated into congressionally reserved areas, late-successional reserves, adaptive management areas, managed late-successional areas, administratively withdrawn areas, riparian reserves, and a matrix encompassing all areas.

One set of standards and guidelines, called Survey and Manage (S/M), provides measures to mitigate potential effects to approximately 400 species, including mosses, liverworts, fungi, lichens, vascular plants, slugs, snails, salamanders, and red tree voles, that may be indicative of late-successional or old growth forests. Scientists consider most of the S/M species to be rare or requiring additional information about the rarity of the species. The standards and guidelines were established under an ecosystem-based approach to managing Forest Service and BLM lands in order to create healthy ecosystems with functioning habitats for native species. Compliance with these standards and guidelines are intended to constitute the Forest Service and BLM's contribution to the recovery of the NSO.

The current and proposed Project boundary segments on Forest Service lands are located within late-successional reserve (LSR) allocations. The standards and guidelines for LSR indicate that road construction is not recommended unless potential benefits exceed the costs of habitat impairment. Within LSR road maintenance may include felling hazard trees along rights-of-way. Leaving woody debris on site and topping trees, instead of felling, should be considered in LSR. Existing developments in LSR, including utility corridors, are considered existing uses, and maintenance of these facilities, including felling of hazard trees, is consistent with the standards and guidelines.

A review of S/M species potentially occurring in the Project area was conducted in collaboration with RR-SNF staff. Appropriate surveys for these species were conducted during study plan implementation. Project management of known S/M species sites would be consistent with the standards and guidelines through establishment of 100-foot buffers around these sites. These buffers would be included in the Project Vegetation Management Plan (Volume III, Appendix C). Potential impacts of Project operations and maintenance, including maintenance of existing roads, maintenance of existing utility corridors, and felling of hazard trees, are consistent with the standards and guidelines for LSR. Through these efforts and continued coordination with Forest Service staff prior to any ground-disturbing activities on RR-SNF lands, the Project would comply with the standards and guidelines.

3. Department of the Army, Corps of Engineers. Water resources development in Oregon. Portland, Oregon. 2000.

This document provides an overview of the role of the Portland District of the ACOE in water resource development and water resource programs. It is informational and is not a management or policy plan.

4. Forest Service. Rogue River National Forest land and resource management plan. Department of Agriculture, Medford, Oregon. 1990.

The Forest Land and Resource Management Plan (Forest Plan) guides all natural resource management activities and establishes management Standards and Guidelines for the Rogue

River National Forest[28]. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management. The Forest Plan establishes Forest-wide multiple-use goals and objectives; Management Area direction, including Management Area prescriptions and Standards and Guidelines that apply to future management activities in that Management Area; the allowable sale quantity for timber and land suitable for timber management; and monitoring and evaluation requirements. The Forest Plan considers existing and future special-use permits and requires the RR-SNF to consider public benefits as well as the special-use permit applicant's need by evaluating the relationship of a proposal to other forest uses and objectives. Similarly, the Forest Plan establishes management goals for minerals and energy including provisions for development and production of energy resources on the Forest in coordination with other resource values, environmental considerations, and laws related to energy development.

The existing and proposed Project boundaries are within Management Areas for Big Game Winter Range, Foreground Retention, Late-Successional Reserve, and Riparian Reserve. There are no proposed Project activities that are inconsistent with the goals, standards, or guidelines for management of these areas. Energy development is not prohibited in any of these Management Areas. Removal of individual hazard trees or multiple, adjacent trees for unforeseen Project facility maintenance would not result in appreciable impacts at the scale of individual Management Area units. When felling trees, PacifiCorp should retain large woody material on-site consistent with the proposed Vegetation Management Plan. Areas of vegetation disturbance should be re-seeded or re-vegetated in coordination with RR-SNF staff. Proposals for ground-disturbing activities, including tree felling, would be coordinated through a Notice to Proceed process with RR-SNF, and the Project would be subject to the terms and conditions of a new special-use permit[29] with RR-SNF, which is required to comply with the Forest Plan objectives. For these reasons, the Project would comply with the Forest Plan.

5. Hydro Task Force and Strategic Water Management Group. Oregon comprehensive waterway management plan. Salem, Oregon. 1988.

The management plan identifies roles and responsibilities of state agencies related to water resources and decision-making processes for the beds and banks of navigable rivers in Oregon. The plan does not apply to the portion of the river that flows through the Project.

6. Oregon Department of Energy. Oregon final summary report for the Pacific Northwest rivers study. Salem, Oregon. 1987.

This document is the final summary report of the Pacific Northwest Rivers Study in Oregon. The study identified resource values that might affect hydropower development. It examined rivers and streams in seven regions in the state: the North Coast, Willamette, Mid-Columbia, Snake River, closed basins, Klamath Basins, and South Coast Regions. The Rogue River is

[28] In December 2003, the Forest Service Washington Office approved administrative consolidation of the Rogue River and Siskiyou National Forests. The Project is located within the former Rogue River National Forest.
[29] The current special-use permit, issued by RRNF on September 25, 1989, will expire concurrently with the FERC license on December 31, 2018.

located in the South Coast Region but is not specifically analyzed in the report. The report does not include any management directives pertinent to the Project.

7. Oregon Department of Environmental Quality. Statewide water quality management plan. Salem, Oregon. 1978.

This broad-based, statewide plan contains a detailed assessment of programs developed to identify point and non-point source pollution programs and identifies control programs. The Project complies with ODEQ state water quality criteria (Section E.6.2.2), and the Project would comply with this management plan.

8. Oregon Department of Fish and Wildlife. The statewide trout management plan. Portland, Oregon. 1987.

The plan provided goals, objectives, strategies and guidelines for the statewide management of trout. It also provided direction for basin, sub-basin, and mini- plans for individual rivers and water bodies. This plan, prepared in 1987, was intended to direct future trout management and was to be reviewed in six years.

The Project provides upstream fish passage and downstream screening and passage for trout species identified in the plan. The fish passage facilities have proven to be successful in facilitating fish passage (Section E.6.3.2) and sustaining populations of trout up- and down-stream of the Project diversion dam. The Project is consistent with the management goals and guidelines presented in the plan.

9. Oregon Department of Fish and Wildlife. Trout mini-management plans. Portland, Oregon. 1987.

The trout mini-management plans were developed for several rivers and lakes to delineate site specific management objectives. The administrative rules (OAR 635-500-0700 through -0800) list the current trout mini-management plans. There are no mini-management plans for the Upper Rogue River sub-basin upstream of Jess Dam. The Project is consistent with the management goals and guidelines presented in the plan.

10. Oregon Department of Fish and Wildlife. Oregon's elk management plan. Portland, Oregon. 2003.

The purpose of Oregon's Elk Management Plan is to guide management decisions related to elk, and to identify ODFW elk management policies and strategies to the public, other agencies, and private landowners for a period of ten years. The Plan's goals are to manage elk populations in Oregon to provide optimum recreational benefits to the public, be compatible with habitat capability and primary land uses, and contribute to a healthy ecosystem. The Plan identifies forest management, range management, and recreation practices as activities that may affect elk habitat. The proposed Project is not in conflict with any of the Plan objectives or proposed strategies.

11. Oregon Department of Fish and Wildlife. Oregon black bear management plan: 2012. Portland, Oregon. 2012.

The 2012 Oregon Black Bear Management Plan updates the 1993–1998 Oregon Black Bear Management Plan. The plan establishes a set of four objectives designed to balance ecological, social, and economic considerations for informed decision making when managing populations of black bears. The objectives are (1) to maintain healthy and optimum bear populations while providing optimum recreational opportunities, and considering objectives related to other wildlife species and the level of human-bear conflicts; (2) to work to reduce the number of human-bear conflicts that result in the removal of bears; (3) to develop, refine, and evaluate population abundance estimation through modeling techniques; and (4) to continue to improve basic understanding of black bear management and ecology through applied research. The proposed Project is not in conflict with any of the Plan objectives or proposed strategies.

12. Oregon Department of Fish and Wildlife. Oregon wildlife diversity plan. Portland, Oregon. 1993.

The Wildlife Diversity Plan provides the program goal, objectives and strategies to identify and coordinate nongame wildlife management, research and status survey needs, and education and recreation needs related to Oregon's wildlife. The document provides direction to the Oregon Department of Fish and Wildlife in carrying out its mandated responsibilities. The plan is also intended as an informational document to be used in wildlife programs by public agencies and others concerned with the conservation of nongame and other fish and wildlife species. It is the goal of the Wildlife Diversity Program to maintain Oregon's wildlife diversity by protecting and enhancing populations and habitats of native wildlife at self-sustaining levels throughout natural geographic ranges. The plan provides for listing of species as endangered, threatened, or sensitive within the state.

Five state-listed sensitive species were observed during relicensing studies: mountain quail, olive-sided flycatcher, Cascades frog, coastal tailed frog, and fisher. With the exception of fisher, which are listed as sensitive-critical, these species are all listed as sensitive-vulnerable. The proposed Project would not adversely affect the self-sustaining populations of these species within the existing and proposed Project boundary. The proposed Project would comply with the general management objectives of this plan.

13. Oregon Department of Fish and Wildlife. Oregon cougar management plan. Roseburg, Oregon. 2006.

This plan establishes five objectives that seek to maintain viable, healthy cougar populations in Oregon, reduce conflicts with cougars, and manage cougars in a manner compatible with other game mammal species. Objective 1 seeks to manage the state’s cougar population at a level well above that required for long term sustainability, Objectives 2 – 4 address solving human-cougar conflict, and Objective 5 seeks to achieve established management objectives for other game mammal species they may be subject to cougar predation. There are no specific management

directives relevant to the proposed Project. The Project would not impact the sustainability of local or state-wide cougar populations.

14. Oregon Department of Fish and Wildlife. Biennial report on the status of wild fish in Oregon. Portland, Oregon. 1995.

The report provides Species Management Unit (SMU) summaries of freshwater and estuarine wild fish species in Oregon. This report is not a management plan, and compliance is not required by private entities.

15. Oregon Department of Fish and Wildlife. Species at risk: Sensitive, threatened, and endangered vertebrates of Oregon. Portland, Oregon. 1996.

This document was developed as an information source to provide general knowledge relative to sensitive, threatened, and endangered vertebrates. It is not a management plan, and its information is not current.

16. Oregon Department of Fish and Wildlife. Oregon conservation strategy. Salem, Oregon. 2016.

ODFW recently completed a 10-year update of the Oregon Conservation Strategy as required by the FWS. The Oregon Fish and Wildlife Commission approved the update on September 4, 2015 for submission to the FWS on October 1, 2015, and the strategy was approved by FWS in August 2016.

This Conservation Strategy provides an adaptive and comprehensive framework that builds on previous plans and provides a menu of recommended voluntary actions and tools to help inspire local communities, landowners, and citizens to define their own conservation role. It is not a regulatory document but instead presents issues, opportunities, and recommended voluntary actions that would improve the efficiency and effectiveness of conservation in Oregon. Key Conservation Issues within the West Cascades ecoregion include disruption of disturbance regimes (e.g., uncharacteristically severe wildfire), invasive species, and barriers to animal movement, the last two of which are addressed by the proposed Project Vegetation Management Plan and wildlife crossing construction, respectively. The proposed Project would comply with both state and federal regulatory frameworks through the Commission's relicensing process, and therefore the Project is consistent with the objectives of the strategy.

17. Oregon Department of Fish and Wildlife. 25-year recreational angling enhancement plan. Salem, Oregon. 2009.

This enhancement plan identifies statewide strategies for enhancing, developing, and promoting diverse and productive recreational fishing opportunities in Oregon. Waters impacted by the existing and proposed Project support self-sustaining populations of native and non-native trout species. The proposed Project would not conflict with the goals and strategies of this plan.

18. Oregon Department of State Lands. Oregon natural heritage plan. Salem, Oregon. 2003.

The mission of the Oregon Natural Heritage Program is to conserve the full range of Oregon's native plants, animals and ecosystems through voluntary and cooperative action. The Oregon Natural Heritage Plan has three roles: (1) describe the components of Oregon's natural heritage; (2) identify natural areas of exceptional value for conservation; and (3) provide opportunities for voluntary conservation on both public and private lands. There are four established natural areas within CLNP to the northeast of the Project, but there are no natural areas within the existing or proposed Project boundary or vicinity. The proposed Project would not conflict with the goals and strategies of this plan.

19. Oregon State Game Commission. Fish and wildlife resources – 18 basins. Portland, Oregon. 21 reports, 1963-1975.

The Rogue Basin report was prepared in 1970 to review fish and wildlife resources, their present status, limiting factors, and water requirements in the basin. It is not a management plan, and its information is not current.

20. Oregon State Parks and Recreation Department. Oregon Outdoor Recreation Plan (SCORP): 2003-2007. Salem, Oregon. 2003.

The current Oregon Statewide Comprehensive Outdoor Recreation Plan (SCORP) was published in July 2013 and is effective through 2017 (Oregon Parks and Recreation Department, 2013). The SCORP identifies a number of important demographic and social changes facing outdoor recreation providers in the coming years including continued population growth, a rapidly aging Oregon population, fewer Oregon youth learning outdoor skills, an increasingly diverse Oregon population and increasing levels of physical inactivity. These issues are described in detail, and key planning recommendations are made on a programmatic and regional basis.

The SCORP planning effort also included a state- and county-level analysis to identify priority Projects for the distribution of Local Government Grant Program funds for both close-to-home areas (located within an urban growth boundary (UGB) or unincorporated community boundary) and dispersed areas (located outside of these boundaries) (Oregon Parks and Recreation Department, 2013). Dispersed area needs identified for Jackson County include RV/trailer campgrounds and facilities, acquisition of natural open space, and picnicking/day-use facilities. The Project Area exhibits low potential for contributing to the satisfaction of these needs. The proposed Project would not conflict with the goals and strategies of this plan.

21. Oregon State Parks and Recreation Division. Recreational values on Oregon rivers. Salem, Oregon. 1987.

The study is not a management plan. It was identified as a first step in inventorying and assessing the value of river recreation in Oregon so as to minimize potential conflicts with hydropower development and to conserve important river resources. The South Fork Rogue River and Rogue River to Lost Creek were given overall ratings of 1 (“Outstanding”) for

recreation, primarily for the assessed outstanding trout fishing resource values. The South Fork Rogue received ratings of 4 ("Limited") and 5 ("Little/None") for all other resource categories, including Canoeing/Kayaking, Rafting, Salmon/steelhead Fishing, and Warm Water Fishing. The ratings were assigned to these river segments following Project construction and prior to the current Project minimum in-stream flow of 10 cfs in the South Fork Rogue below the diversion dam. The identified river segments support healthy trout fisheries upstream and downstream of the Project, and therefore, the proposed Project would not significantly impact the assessed recreational values.

22. Oregon Water Resources Board. Surface area of lakes and reservoirs. Salem, Oregon. 1973.

This document tabulated all lakes and reservoirs in Oregon over one acre in size. It is not a management plan.

23. Oregon Water Resources Commission. State of Oregon water use programs. Salem, Oregon. 1987.

This document provides an overview of state water use programs by basin. The proposed Project would not conflict with the program statements for the Upper Rogue Basin. Coordination with Oregon Departments of Environmental Quality, Fish and Wildlife, and Water Resources during the scoping, study planning, study reporting, and license application processes would ensure that the Project would comply with applicable Oregon water use programs.

24. Oregon Water Resources Department. Oregon water laws. Salem, Oregon. 1988.

This document contains water-related statutes. It is not a management plan. Coordination with Oregon Departments of Environmental Quality, Fish and Wildlife, and Water Resources during the scoping, study planning, study reporting, and license application processes would ensure that the Project would comply with applicable Oregon water laws.

25. U.S. Fish and Wildlife Service. Canadian Wildlife Service. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.

This plan was updated in 1994, 1998, and 2004 and revised in 2012. The revised plan presents a scientific approach to international waterfowl habitat restoration and protection. The plan sets forth three overarching goals including abundant and resilient waterfowl populations, wetland and related habitats sufficient to sustain waterfowl populations at desired levels, and growing numbers of citizens who enjoy and actively support waterfowl and wetlands conservation. The existing and proposed Project does not exert significant adverse impacts on waterfowl or their habitat, and the Project is outside of areas of greatest continental significance to North American waterfowl. The Project does not conflict with the objectives or recommendations provided by the plan.

26. U.S. Fish and Wildlife Service. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, DC. No date.

This document establishes national policy for agencies, organizations, and individuals to enhance the vitality of recreational fisheries at the local, state, and national levels. The FWS' established policy is to preserve, restore, and enhance fish populations and their habitats; promote recreational fishing on FWS and other lands; ensure that recommendations concerning recreational fisheries are included in studies and management efforts performed by the FWS; serve as an active partner with other agencies and organizations in developing recreational fisheries programs; promote conservation and enhancement through federal grant programs; and improve and expand quantifiable economic valuations of national recreational fisheries. The FWS may ensure that the policy objectives are supported through participation in the Commission's relicensing process. The Project is not in conflict with the goals and strategies presented in the policy.

E.9 CONSULTATION PROCESS

FERC regulations require license applicants to consult with appropriate resource agencies and other interested parties before filing license applications. The following sections document PacifiCorp's consultation efforts

E.9.1 Scoping

Compliance with NEPA requires any public agency that would permit or fund a major Project to evaluate the environmental and social consequences of the proposed action. Public involvement in the environmental review process is a key element of NEPA. Consistent with requirements for public involvement, on August 30, 2013 the Commission issued Scoping Document 1, which identified preliminary resource issues and invited agency and public participation in scoping meetings that were held on September 24, 2013. The Commission and PacifiCorp conducted a publicly-noticed site visit to the Project in conjunction with the scoping meeting on September 24, 2013 to allow participants to develop a basic understanding of the Project facilities and operations. On December 19, 2013, the Commission issued Scoping Document 2, which addressed comments received during scoping meetings and the subsequent public comment period.

E.9.2 Consultation Documentation

Over the course of the ILP, PacifiCorp consulted with a variety of stakeholders (agencies, tribes, non-governmental organizations, and members of the public) to discuss the Project, resource issues, resource studies, and PM&Es. Stakeholders were contacted via mail, e-mail, phone call, FERC filings, and in-person regarding available information, significant events, periodic updates, meeting announcements, and opportunities for written comments. As the Commission's non-federal representative for Endangered Species Act (ESA) Section 7 consultation and National Historic Preservation Act Section 106 consultation, PacifiCorp informally consulted

with the appropriate agencies and tribes during study plan preparation, implementation and reporting. Pursuant to CFR § 5.18(b)(5)(ii)(G), a list of the name and address of every federal, state, and interstate resource agency, Indian tribe, or member of the public with which PacifiCorp consulted in preparation of Exhibit E is included as Appendix E of Volume III of the license application. A list of consultations conducted by PacifiCorp during the ILP is provided below in Table 50. Supporting consultation documents are available upon request.

Table 50. ILP consultation record

Date	Consulting Parties	Method of Consultation	Topic of Consultation
2/1/2013	Interested Parties Distribution List	Letter from PacifiCorp	Request for information relevant to relicensing
2/4/2013	Joni Brazier (RR-SNF, Soil Scientist)	Phone call from PacifiCorp	Soil Resource Inventory
2/4/2013	Joni Brazier (RR-SNF, Soil Scientist)	Email from Forest Service	Soil Resource Inventory and geology information
2/8/2013	Tom O'Keefe (American Whitewater)	Email from American Whitewater	Response to PacifiCorp's request for information
2/12/2013	Joni Brazier (RR-SNF, Soil Scientist)	Email string with PacifiCorp	Soil Resource Inventory GIS
2/12/2013	Dennis Griffin (SHPO)	Letter from SHPO	Response to PacifiCorp's request for information
2/21/2013	Wayne Rolle (RR-SNF, Botanist)	Phone call from PacifiCorp	Known sensitive species and noxious weed locations
2/21/2013	Dennis Griffin (SHPO)	Phone call from PacifiCorp	Initial contact and discussion of known resources
2/21/2013	Wayne Rolle (RR-SNF, Botanist)	Email from PacifiCorp	Delivery of request for information
2/25/2013	Dennis Griffin (SHPO)	Phone call from SHPO	SHPO case number
2/25/2013	Dennis Griffin (SHPO)	Email from PacifiCorp	Confirmation of SHPO case number
2/26/2013	Kelly Coates (Cow Creek Band)	Letter from Cow Creek	Response to PacifiCorp's request for information
3/1/2013	Dave Harris (ODFW)	Email from ODFW	Response to PacifiCorp's request for information
3/5/2013	Dave Clayton (RR-SNF, Wildlife Biologist)	Email from Forest Service	Northern spotted owl GIS
3/7/2013	Terrald Kent (USDI-BOR)	Letter from USDI-BOR	Confirmation of no affect to BOR facilities
3/12/2013	Jennifer Hill (FERC)	Letter from FERC	Advance notice of license expiration

Date	Consulting Parties	Method of Consultation	Topic of Consultation
4/4/2013	Wayne Rolle (RR-SNF, Botanist)	Email from Forest Service	Response to PacifiCorp's request for information
4/22/2013	Dianne Rodman (FERC)	Email from PacifiCorp	Initial contact and proposed schedule
4/23/2013	Dianne Rodman (FERC)	Email from FERC	Approval of proposed schedule
6/11/2013	Bill Cross (American Whitewater)	Phone call from PacifiCorp	Initial contact and request for information
6/11/2013	Bill Cross (American Whitewater)	Email from Bill to Southern Oregon Waterdogs	Request for information relevant to relicensing
6/11/2013	Jared Sandeen (Private citizen)	Email string with PacifiCorp	Whitewater boating in the South Fork Rogue
7/30/2013	Dianne Rodman (FERC)	Email from PacifiCorp	Delivery of interested parties mailing list
8/9/2013	Jennifer Hill, Dianne Rodman (FERC)	Email from PacifiCorp	Project maintenance during scoping site visit
8/20/2013	Jason Allen, Dennis Griffin (SHPO)	Letter from SHPO	Comments on NOI and PAD
8/27/2013	Jason Allen, Dennis Griffin (SHPO)	Letter from PacifiCorp	Response to SHPO comments on NOI and PAD
8/30/2013	FERC	Formal notice from FERC	Notice of initiation of relicensing, request for comments
8/30/2013	FERC	Letter from FERC	Scoping Document 1
9/23/2013	Doug Heiken (Oregon Wild)	Document filed with FERC	Scoping comments
9/24/2013	FERC, et al.	Scoping meetings and site visit	Project scoping and identification of issues
10/2/2013	Dianne Rodman (FERC)	Email from PacifiCorp	Formerly federal lands currently owned by PacifiCorp
10/10/2013	FERC	FERC issuance	Transcript of scoping meeting
10/17/2013	Dianne Rodman (FERC)	Email string with PacifiCorp	Follow-up on formerly federal lands
10/23/2013	Kristen Bonanno (Forest Service)	Document filed with FERC	Request for extension of time to file comments
10/25/2013	FERC	FERC issuance	Revised process plan and schedule
10/25/2013	FERC	FERC issuance	Delegated order granting extension of time to file

Date	Consulting Parties	Method of Consultation	Topic of Consultation
10/25/2013	FERC	FERC issuance	Study requests and additional information request (AIR)
11/13/2013	Forrest English (Rogue Riverkeeper), Brian Barr (Geos Institute)	Document filed with FERC	Scoping comments and study requests
11/14/2013	Chris Stine (ODEQ)	Document filed with FERC	Scoping comments and study requests
11/14/2013	Michael Linde (Park Service)	Document filed with FERC	Scoping comments and study requests
11/14/2013	Tom O'Keefe (American Whitewater)	Document filed with FERC	Scoping comments and study requests
11/14/2013	Dave Harris (ODFW)	Document filed with FERC	Scoping comments and study requests
11/14/2013	Kelly Coates (Cow Creek Band)	Document filed with FERC	Scoping comments and study requests
11/14/2013	Robert MacWhorter (RR-SNF)	Document filed with FERC	Scoping comments and study requests
11/14/2013	Jim Thrailkill (FWS)	Document filed with FERC	Scoping comments and study requests
11/22/2013	Wayne Rolle (RR-SNF, Botanist)	Email string with PacifiCorp	Botanical resources study request
12/19/2013	FERC	Letter from FERC	Scoping Document 2
12/20/2013	FERC	Document filed with FERC	Proposed Study Plans and Response to AIR
12/23/2013	Kristen Bonanno, Jeff Von Kienast (Forest Service)	Email string with PacifiCorp	Study plan meeting schedule
1/6/2014	Kelly Coates (Cow Creek Band)	Email string with PacifiCorp	Site tour request and ILP filing information
1/6/2014	Dianne Rodman (FERC)	Phone call from PacifiCorp	Level of study required for issues identified in Scoping Document 2
1/28/2014	FERC, et al.	Proposed Study Plan meeting in Medford, OR	Proposed Study Plans
1/28/2014	Wayne Rolle (RR-SNF, Botanist)	Email string with PacifiCorp and Cow Creek Band	Cultural sensitive plant species
1/29/2014	Steve Brazier (RR-SNF, fisheries biologist)	Email from Forest Service	Recommendation of contractor for Level II Stream Surveys

Date	Consulting Parties	Method of Consultation	Topic of Consultation
2/3/2014	Steve Hawken, Jennifer Hill, Kim Nguyen, Dianne Rodman, Scott Van Norman (FERC)	Phone conference call	Discussion of engineering review required for planned flowline and siphon replacement
2/4/2014	FERC, et al.	Email from PacifiCorp	Study plan meeting notes
2/5/2014	Dave Harris (ODFW)	Email string with PacifiCorp	Submerged orifice velocity criteria
2/13/2014	Dave Harris (ODFW)	Email from ODFW	Suggested edits to study plan meeting notes
2/19/2014	Dave Harris, et al. (ODFW)	Email string with PacifiCorp	Impoundment survey protocols
2/24/2014	FERC, FWS, Forest Service, Cow Creek Band	Email from PacifiCorp	Early, courtesy submittal of revised fish passage facilities study plan
3/11/2014	FERC	Document filed with FERC	Documentation of project tour provided for Cow Creek Band
3/19/2014	Tom O'Keefe (American Whitewater)	Document filed with FERC	Comments on proposed study plan
3/27/2014	Chris Stine (ODEQ)	Document filed with FERC	Comments on proposed study plan
3/27/2014	Mary Grainey (OWRD)	Document filed with FERC	Comments on proposed study plan
3/27/2014	FERC	Document filed with FERC	Comments on proposed study plan
3/28/2014	Rob MacWhorter (RR-SNF)	Document filed with FERC	Comments on proposed study plan
3/28/2014	Dave Harris (ODFW)	Document filed with FERC	Comments on proposed study plan
3/31/2014	Kelly Coates (Cow Creek Band)	Document filed with FERC	Comments on proposed study plan
3/31/2014	Kelly Coates (Cow Creek Band)	Email from Cow Creek	Transmittal of lamprey survey protocol
4/2/2014	Les Moscoso (Forest Service)	Document filed with FERC	Correction to comments on proposed study plan
4/7/2014	Kelly Coates (Cow Creek Band)	Email from Cow Creek	Discussion of lamprey survey protocol
4/16/2014	Sheila Colyer (RR-SNF, Wildlife Biologist)	Email from Forest Service	Northern spotted owl GIS and surveys

Date	Consulting Parties	Method of Consultation	Topic of Consultation
4/21/2014	Dave Harris (ODFW)	Email from PacifiCorp	Update on information requested by ODFW
4/28/2014	FERC	Document filed with FERC	Filing of revised study plan
4/30/2014	Dave Clayton (RR-SNF, Wildlife Biologist)	Email from Forest Service	Red tree vole surveys are not required
5/9/2014	Various private citizens	Email from PacifiCorp	Invitation to whitewater boating study plan meeting
5/13/2014	Dave Harris (ODFW)	Document filed with FERC	Comments on revised study plan and request for additional information
5/13/2014	Mary Grainey (OWRD)	Document filed with FERC	Comments on revised study plan
5/14/2014	Chris Stine (ODEQ)	Document filed with FERC	Comments on revised study plan
5/14/2014	Kelly Coates (Cow Creek Band)	Document filed with FERC	Comments on revised study plan
5/20/2014	Forest Service, Joseph Hatcher (private citizen)	Meeting in Medford, OR	Whitewater boating study plan meeting
5/27/2014	FERC	FERC issuance	Study plan determination
5/30/2014	FERC	Document filed with FERC	Documentation of response to ODFW's request for additional information regarding fish passage facilities, operations and maintenance
6/4/2014	Dave Harris (ODFW)	Email from PacifiCorp	Response to ODFW information request
8/27/2014	FERC	FERC issuance	Restricted service list for historic properties
9/22/2014	Jessie Plueard (Cow Creek)	Email from PacifiCorp contractor HRA	Receipt of ARPA permit for archaeological surveys from RR-SNF
9/23/2014	Harry Williamson, Susan Rosebrough (Park Service)	Email string with PacifiCorp	Update on ILP process and whitewater study plan
11/11/2014	Jessie Plueard (Cow Creek)	Email from Cow Creek	Submittal of cultural monitoring report
11/20/2014	Melissa Schroeder (RR-SNF, archaeologist)	Email from PacifiCorp contractor HRA	Permit extension request and survey update

Date	Consulting Parties	Method of Consultation	Topic of Consultation
12/22/2014	ODFW	Document filed with ODFW	Scientific take permit application for use of native and hatchery fish in biological evaluation
1/14/2015	Matt Cutlip, Dianne Rodman (FERC)	Phone call from PacifiCorp	Initial study report check-in and discussion of reporting requirements
2/1/2015	Mike Castellano (Forest Service Forestry Sciences Lab)	Research and analysis with PacifiCorp contractor Pacific Crest Consulting	Identification of unknown fungi species
2/20/2015	Various ODFW staff	Email string with PacifiCorp	Coordination for fish passage evaluation hatchery fish
2/25/2015	Kelly Coates (Cow Creek Band)	Email from Cow Creek	Submittal of lamprey survey report
3/11/2015	Sheila Colyer (RR-SNF, Wildlife Biologist)	Email string with PacifiCorp	S/M survey validity period and incidental observations
4/23/2015	FERC, et al.	Email from PacifiCorp	Invitation to initial study report meeting in Medford, OR
4/30/2015	Dan Van Dyke (ODFW)	Email string with PacifiCorp	Coordination for fish passage evaluation hatchery fish
5/6/2015	Sheila Colyer (RR-SNF, Wildlife Biologist)	Email string with PacifiCorp	Submittal of wildlife survey results
5/12/2015	FERC	Document filed with FERC	Initial Study Reports
5/27/2015	FERC, et al.	Meeting in Medford, OR	Initial study repot meeting in Medford, OR
6/2/2015	Craig Erwin (ODFW, Hatchery Assistant Manager)	Email string with PacifiCorp	Coordination for fish passage evaluation hatchery fish
6/10/2015	FERC	Document filed with FERC	Initial study repot meeting summary
6/12/2015	Dan Van Dyke, et al. (ODFW)	Email string with PacifiCorp	Delay of hatchery fish pick-up
6/15/2015	Dave Harris, Dan Van Dyke (ODFW)	Email string with PacifiCorp	Discussion of delay for fish passage biological evaluation
6/24/2015	Michael Linde (Park Service)	Document filed with FERC	Concurrence with results of whitewater boating study report
7/2/2015	Dennis Griffin (SHPO)	Email string with PacifiCorp	Coordination and update on ILP proceedings

Date	Consulting Parties	Method of Consultation	Topic of Consultation
7/2/2015	Dennis Griffin (SHPO)	Email from SHPO	SHPO case numbers and receipt of ISR
7/6/2015	Kelly Coates (Cow Creek Band)	Email string with PacifiCorp	Response to questions regarding aquatic study reports
7/13/2015	ODEQ	Document filed with FERC	Comments on Initial Study Report
7/13/2015	Cow Creek Band	Document filed with FERC	Comments on Initial Study Report
7/15/2015	Les Moscoso (Forest Service)	Email string with PacifiCorp	Comments on Initial Study Report
7/17/2015	Roger Roper (SHPO)	Certified mail delivery from PacifiCorp	Direct delivery of Initial Study Report
7/21/2015	Wayne Rolle (RR-SNF, Botanist)	Email string with PacifiCorp	Transmittal of botanical sighting report forms
7/21/2015	FERC	Document filed with FERC	Documentation of delivery of ISR to SHPO
7/21/2015	Wayne Rolle (RR-SNF, Botanist)	Email from Forest Service	Concurrence with botanical study report results and completeness
8/10/2015	Jason Allen (SHPO)	Letter from SHPO	Evaluation of resources within the NRHP-eligible historic district
8/13/2015	Matt Cutlip (FERC)	Phone call from PacifiCorp	Discussion of PLP versus DLA filing and DLA requirements
8/13/2015	Kim Nguyen (FERC)	Phone call from PacifiCorp	Discussion of DLA supporting design report requirements
8/14/2015	Christine Curran (SHPO)	Certified mail delivery from PacifiCorp	Direct delivery of Initial Study Report on compact disc
8/18/2015	Dennis Griffin (SHPO)	Letter from PacifiCorp	Authorization of HRA as PacifiCorp's designated archaeological surveyor
8/19/2015	Chris Stine (ODEQ)	Email string with PacifiCorp	401 Certification process
9/1/2015	John Pouley (SHPO)	Document from SHPO	Archaeological Permit No. 2113
10/14/2015	Ross Curtis (SHPO)	Letter from SHPO	Concurrence with APE and study results to date

Date	Consulting Parties	Method of Consultation	Topic of Consultation
12/1/2015	ODFW	Document filed with ODFW	Scientific take permit reporting for biological testing of fish passage facilities
12/1/2015	ODFW	Document filed with ODFW	Scientific take permit year-end report
1/11/2016	Heather Wade (ODLCD)	Email from ODLCD	CZMA exemption concurrence
2/17/2016	Dianne Rodman (FERC)	Phone call from PacifiCorp	Discussion of Updated Study Report and DLA requirements
2/23/2016	Jim Thrailkill (FWS)	Phone call from PacifiCorp	Discussion of potential consultation requirements and ILP schedule
2/23/2016	Jim Thrailkill (FWS)	Email from PacifiCorp	Information on ILP schedule and participants
4/26/2016	Dianne Rodman (FERC)	Phone call from PacifiCorp	Discussion of DLA, PM&E proposals, and FERC boundary interface with sag-pipe
5/5/2016	Dianne Rodman (FERC)	Phone call from PacifiCorp	Follow-up on Supporting Design Report and FERC boundary interface with sag-pipe
5/11/2016	FERC	Document filed with FERC	Updated Study Reports
5/22/2016	FERC, et al.	Meeting in Medford, OR	Updated Study Report Meeting
7/6/2016	Jamie French (SHPO)	Letter from SHPO	Concurrence with determination of ineligibility for 35JA927
7/7/2016	Jessica Gabriel (SHPO)	Email from PacifiCorp	Request for status update on SHPO concurrence with above-ground structures portion of Updated Study Report
7/11/2016	Matt Cutlip (FERC)	Phone call from PacifiCorp	Discussion of DLA filing requirements
7/13/2016	Jessica Gabriel (SHPO)	Letter from SHPO	Concurrence with historic district eligibility and adverse effect determinations
7/20/2016	Christopher Bell (ODOT)	Email from HRA	Eligibility status of ODOT bridge 16017

Date	Consulting Parties	Method of Consultation	Topic of Consultation
8/22/2016	Tracie Nickel (Jackson County)	Email from Jackson County	Land use compatibilty statement submitted in response to PacifiCorp's request of 8/17/2016
8/25/2016	FERC	Document filed with FERC	SHPO Letters of Concurrence
8/31/2016	Chris Stine (ODEQ)	Email from PacifiCorp	Submittal of draft application for water quality certification
8/31/2016	Jim Thrailkill (FWS)	Emails to and from PacifiCorp	Request for informal consultation
9/1/2016	Jim Thrailkill (FWS)	Emails to and from PacifiCorp	Informal consultation process
10/5/2016	Jessica Gabriel (SHPO)	Email to PacifiCorp	SHPO comments on the draft HPMP
10/6/2016	Matt Cultlip (FERC)	Phone call from PacifiCorp	Discussion of DLA filing adequacy
10/6/2016	Matt Cultlip (FERC)	Email from FERC	Proposed terms and conditions discussed in FLA
10/31/2016	Dianne Rodman (FERC)	Phone call from FERC	Confirmation that FERC did not have any comments on the DLA
10/31/2016	ODFW	Document filed with FERC	Comments on the DLA
11/2/2016	Dianne Rodman, John Matkowski (FERC)	Phone call from PacifiCorp	Discussion of comments filed on DLA and preparation of FLA
11/10/2016	Jim Thrailkill (FWS)	Phone call from PacifiCorp	Review of DLA and discussion of pending conference decision letter
11/14/2016	FERC	Document filed with FERC	Filing of SHPO comments of 10/5/2016
11/18/2016	Sheila Colyer (RR-SNF, Wildlife Biologist)	Emails to and from PacifiCorp	NSO demography survey results in 2015 and 2016
11/21/2016	Sheila Colyer (RR-SNF, Wildlife Biologist)	Emails to and from PacifiCorp	NSO demography survey results in 2015 and 2017
11/28/2016	Jim Thrailkill (FWS)	Emails to and from PacifiCorp	Follow-up on NSO demography survey results in 2015 and 2016

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